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Successful tests carried out for Pinaka Extended Range System, Area Denial Munitions & New Indigenous Fuzes

Successful tests of Pinaka Extended Range (Pinaka-ER), Area Denial Munitions (ADM) and indigenously developed fuzes have been carried out at various test ranges. The Pinaka-ER Multi Barrel Rocket Launcher System was successfully tested at Pokharan range. The system is jointly designed by laboratories of Defence Research and Development Organisation (DRDO) - Armament Research & Development Establishment (ARDE), Pune and High Energy Materials Research Laboratory (HEMRL), Pune.

The DRDO, after establishing the performance efficacy of the enhanced range Pinaka, transferred the technology of the system to the industry. The Industry Partner has manufactured enhanced Pinaka Mk-1 rockets with DRDO's handholding during the production and Quality Assurance. In continuation of the Transfer of Technology absorption, rockets developed by the industry have undergone the performance evaluation and quality certification process. The hand holding during the production, quality assurance and launch coordination for bulk production is being provided by the DRDO design team and QA agencies nominated for the system.



The DRDO, along with the Army, conducted series of performance evaluation trials of these industry produced rockets at Field Firing Ranges during the last three days. In these trials, enhanced range Pinaka rockets were test fired at different ranges with various warhead capabilities. All the trial objectives were met satisfactorily. A number of 24 rockets were fired for different ranges and warhead capabilities to meet the objectives of accuracy and consistency. With this, the initial phase of technology absorption of Pinaka-ER by the Industry Partner has successfully been completed making the Industry Partner ready for series production of the rocket system.

The Pinaka-ER is the upgraded version of earlier Pinaka version which has been in service with the Indian Army for the last decade. The system has been designed in the light of emerging requirements with advanced technologies enhancing the range.

The Area Denial Munition (ADM) variants of munition designed by the ARDE, Pune for Pinaka and manufactured by the industry partners under technology transfer were successfully carried out at Pokhran Field Firing Ranges. These trials are part of performance evaluation under technology absorption.

The indigenously-developed proximity fuzes for Pinaka rockets have also been tested. The ARDE, Pune has developed different fuzes for Pinaka rocket for different types of applications.

After design validation trials, dynamic performance evaluation of these fuzes have been evaluated with flight testing. Consistency in performance of fuzes has been established in consecutive flight trials.

These has been developed through dedicated indigenous R&D efforts for the first time in the country. These indigenously developed fuzes will replace the imported fuzes and save foreign exchange. The ARDE has also designed miniaturised fuzes for ADMs. Performance of dual-purpose Direct-Action Self Destruction (DASD) & Anti-Tank Munition (ATM) fuzes were evaluated during the current flight trials and the results were satisfactory. All the mission objectives were successfully in all the above trials.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1780412>



पत्र सूचना कार्यालय

भारत सरकार

रक्षा मंत्रालय

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पिनाक एक्सटेंडेड रेंज सिस्टम, एरिया डिनायल म्यूनिशंस और न्यू इंडीजिनस फ्यूज़ का सफल परीक्षण सम्पन्न

पिनाक एक्सटेंडेड रेंज सिस्टम (पिनाक विस्तृत मारक प्रणाली), एरिया डिनायल म्यूनिशंस (एडीएम) और न्यू इंडीजिनस फ्यूज़ (नव स्वदेशी विस्फोटक) का सफल परीक्षण विभिन्न परीक्षण स्थलों पर सम्पन्न हुआ। पिनाक ईआर मल्टी बैरल रॉकेट लॉन्चर सिस्टम का कामयाब परीक्षण पोखरण रेंज में किया गया। इस प्रणाली को रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) की प्रयोगशालाओं - पुणे स्थित आयुध अनुसंधान एवं विकास स्थापना (एआरडीई) तथा उच्च ऊर्जा सामग्री अनुसंधान प्रयोगशाला (एचईएमआरएल) ने संयुक्त रूप से डिजाइन किया है।

पिनाक की बढ़ी हुई मारक क्षमता तय हो जाने के बाद डीआरडीओ ने इस प्रणाली की प्रौद्योगिकी को उद्योग को हस्तांतरित कर दिया। उद्योग साझीदार ने उक्त पिनाक एमके-1 रॉकेट का निर्माण किया। उत्पादन और गुणवत्ता पालन के लिये डीआरडीओ ने पूरा सहयोग किया था। प्रौद्योगिकी हस्तांतरण की निरंतरता के मद्देनजर उद्योग द्वारा विकसित रॉकेटों को क्षमता मूल्यांकन और गुणवत्ता प्रमाणीकरण प्रक्रिया से गुजरना पड़ा। उत्पादन, गुणवत्ता पालन और थोक उत्पादन के समन्वय में सहयोग डीआरडीओ की डिजाइन टीम ने किया। इसके अलावा प्रणाली की गुणवत्ता की जांच के लिये नियुक्त एजेंसी ने भी सहयोग दिया।

सेना के साथ डीआरडीओ ने पिछले तीन दिनों के दौरान फील्ड फायरिंग रेंज में उद्योग द्वारा उत्पादित इन रॉकेटों की मारक क्षमता का मूल्यांकन तथा परीक्षण किया। इन परीक्षणों में, उन्नत मारक क्षमता वाले पिनाक रॉकेटों का परीक्षण विभिन्न विस्फोटक क्षमताओं के साथ भिन्न-भिन्न दूरी से किया गया। सारे परीक्षण लक्ष्यों की पूर्ति संतोषजनक रही। विभिन्न दूरियों से 24 रॉकेटों को विस्फोटक क्षमताओं के साथ दागा गया और सबने पूरी सटीकता तथा स्थिरता के साथ लक्ष्य को भेदा। इसके साथ ही उद्योग साझीदार द्वारा पिनाक-ईआर की प्रौद्योगिकी के शुरुआती चरण को सफलतापूर्वक पूरा किया गया। इसके निर्माण में उद्योग भी सफल रहा। अब उद्योग साझीदार रॉकेट प्रणाली की पूरी श्रृंखला के उत्पादन के लिये तैयार है।

పినాక-ఐఆర్ పురానె పినాక సంస్కరణ కె ఉన్నత సంస్కరణ డే। పులె వాలె పినాక రౌకెట్ పిఱ్ఱె దశక సె భారతీయ సెనె మే శెమిల డే। డిస ప్రణాలీ కీ డిజెయిన్ కు మారక దూరి బడెనె కీ ఉన్నత ప్రొడ్యుగికి కె సెఠ నడి జస్రతొ కు డ్యెన మే రఱకర తేయార కియె గయె డే।

పినాక కె లియె ఁఆర్ఢిఐ, పుణె ద్వారె డిజెయిన్ కియె గయె ఁరియె డినెయిల మ్యూనిషెన (ఁఢిఁమ) కె నిర్మణ ఉద్యుగ సెఱ్ఱిదారొ నె కియె డే। డిసకీ ప్రొడ్యుగికి డీ ఉన్ఢే ప్రదెన కీ గడి డీ। డిన్ యుద్ఢ సెమగ్రియొ కె కెమయెబ పరికషణ పుఖరణ ఫీల్డ ఫయరీంగ రేజ మే కియె గయె। డిన్ పరికషణొ కె ఉదదేశ యఢ పరఱనె డీ డెఠ కి ప్రొడ్యుగికి కు ఉద్యుగ సెఱ్ఱిదారొ నె కిస తరఢ అపనెయె డే।

పినాక రౌకెట్ొ కె లియె స్వదేశీ స్తర పర వికసిత ఫ్యూజొ కె డీ పరికషణ కియె గయె। పుణె స్థిత ఁఆర్ఢిఐ నె పినాక రౌకెట్ొ కె లియె విభిన్న ఫ్యూజ వికసిత కియె డే, జిన్కె విన్న-విన్న ఉపయుగ డే। పులె నిర్మణ కరనె కె లియె డిన్కె డిజెయిన్ తేయార కియె గయె। ఉసకె బెద ఫ్యూజొ కీ కుశలతె కె మ్యూన్కన కియె గయె, జిసకె లియె ఉఢెన పరికషణ పూ కియె గయె। లగెతార ఉఢెన పరికషణొ మే ఫ్యూజ కె ప్రదర్శన సఢీక రఢె।

డిన్కె వికెసె సమర్పిత స్వదేశీ అనుసంఢెన ఁవ వికెసె ప్రయెసొ కె జరియె దేశ మే పులె బెర కియె గయె డే। స్వదేశీ స్తర పర వికసిత యె ఫ్యూజ, ఆయెతిత ఫ్యూజొ కీ జగఢ లేగె తఢె డిససె విదేశీ ముద్రె కీ బఱత ఢుగి। ఁఆర్ఢిఐ నె ఁఢిఁమ కె లియె లఘు ఫ్యూజ డీ డిజెయిన్ కియె డే। దుఢెరె ఉదదేశ్య వాలె డెయరెకె-ఁకషెన సెల్ఫ డిస్ట్రక్షెన (ఢిఁఁసఢి) ఁఱ ఁఢి-ఢేక మ్యూనిషెన (ఁఢిఁమ) ఫ్యూజొ కె ముజుదె ఉఢెన పరికషణొ కె దుఱెన మ్యూన్కన కియె గయె। డిన్కె నతిజె డీ సంతుషజనక రఢె। సఢీ ఉపరొకెత పరికషణొ మే సఢీ మిషెన లకష్యొ కు సఫలతెపూర్వక పూ కియె గయె।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1780441>



రక్షణ మంత్రిత్వ శాఖ

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విజయవంఢమైస పినెకె ఁక్సెటెంఢెడ్ రేంజ్ సిస్టెమ్, ఁరియె డెనియల్

మ్యూనిషెన్స్, స్వదేశీంగా అభివృద్ఢి చేసిన ప్రొక్సిమిటీ ఫ్యూజెల పరికషలు

వివిధ పరికషె కేంద్రాలలో పినెకె ఁక్సెటెంఢెడ్ రేంజ్ (పినెకె-ఁఆర్), ఁరియె డెనియల్ మ్యూనిషెన్స్ (ఁఢిఁమ) మరియు స్వదేశీంలో అభివృద్ఢి చేసిన ప్రొక్సిమిటీ ఫ్యూజెల పని తీరుపై నిర్వఢించిన పరికషలు విజయవంఢమయ్యాయి. పొఖరన్ రేంజ్ లో పినెకె-ఁఆర్ మల్టీ బ్యారెల్ రెకెట్ లెంఢర్ సిస్టెమ్ ను విజయవంఢంగా పరికషించారు. ఁ వ్యవస్ఢను పూణే కేంద్రంగా పనిచేస్తున్న ఆర్మమెంట్ రీసెర్చ్ అండ్ డెవలప్ మెంట్ ఁస్టెబ్లిష్మెంట్, హై ఁనర్ఢి మెటీరియల్స్ రీసెర్చ్ లెబొరేటరీ, రక్షణ పరిశోధన అభివృద్ఢి సంఢ (ఢిఁఆర్ ఢిఁబ) సంయుక్తంగా అభివృద్ఢి చేశాయి.

అభివృద్ఢి చేసిన పినెకె సెమర్ఢ్యెన్సి విజయవంఢంగా పరికషించిన ఢిఁఆర్ఢిఁబ ఢిని సెంకేతికతను పరికషమకు బదిలీ చేసింది. ఉత్పత్తి, నెణ్యతె ప్రమెణాల సమయంలో ఢిఁఆర్ఢిఁబ సహకారంతో పరికషమ పినెకె ఁంకే -2 రెకెట్

ల సామర్థ్యాన్ని మరింత అభివృద్ధి చేసింది. సాంకేతిక బదిలీ సమయంలో కుదిరిన ఒప్పందం ప్రకారం పరిశ్రమ అభివృద్ధి చేసిన రాకెట్ల పనితీరును పరీక్షించి, వాటి నాణ్యతను నిర్ధారించడం జరిగింది. పెద్ద సంఖ్యలో రాకెట్లను ఉత్పత్తి చేయడానికి, నాణ్యతను పరీక్షించివాటిని ప్రయోగించడానికి అవసరమైన సహాయ సహకారాలను డిఆర్ డిఓ, వ్యవస్థ కోసం ఏర్పాటైన నాణ్యతా నిర్ధారణ సంస్థలు అందజేశాయి.

అనుమతి పొందిన పరిశ్రమలు ఉత్పత్తి చేసిన రాకెట్ల సామర్థ్యం, పనితీరును గత మూడు రోజులుగా పదాతి దళం సహకారంతో డిఆర్ డిఓ ఫీల్డ్ ఫైరింగ్ కేంద్రాల్లో నిర్వహించింది. దూరంలోని లక్ష్యాలను చేదించడం. ఆయుధాలను మోసుకుని వెళ్లడం లాంటి అంశాలలో అభివృద్ధి చేసిన పినాక రాకెట్లను డిఆర్ డిఓ పరీక్షించింది. ఖచ్చితత్వం మరియు స్థిరత్వం లక్ష్యాలను ఏమేరకు సాధించగలవన్న అంశాన్ని పరీక్షించడానికి డిఆర్ డిఓ 24 రాకెట్లను పరీక్షించింది. ఈ పరీక్షతో భాగస్వామ్య పరిశ్రమ వర్గాలకు పినాక-ఈఆర్ సాంకేతిక బదిలీ ప్రాథమిక దశ పూర్తి అయ్యింది. సాంకేతిక బదిలీ పొందిన పరిశ్రమ ఈ శ్రేణి రాకెట్ వ్యవస్థ ఉత్పత్తి ప్రారంభించగలుగుతుంది.

గత పది సంవత్సరాలుగా భారత సైన్యం వినియోగిస్తున్న పినాకా వ్యవస్థను అభివృద్ధి చేసి పినాకా-ఈఆర్ వ్యవస్థకు రూపకల్పన చేయడం జరిగింది. మారుతున్న అవసరాలకు అనుగుణంగా అధునాతన సాంకేతికతతో పినాకా-ఈఆర్ వ్యవస్థ సిద్ధమయ్యింది.

పినాకా కోసం ఏరియా డినియల్ మ్యూనిషన్ మందుగుండు సామాగ్రి రూపాంతరాలను పూణే కు చెందిన ఆర్మమెంట్ రీసెర్చ్ అండ్ డెవలప్ మెంట్ ఎస్టాబ్లిష్ మెంట్ అభివృద్ధి చేసింది. సాంకేతిక బదిలీ పై జరిగిన ఒప్పందంలో భాగంగా వీటిని పరిశ్రమ ఉత్పత్తి చేసింది. దీనిని పోల్జాన్ ఫీల్డ్ ఫైరింగ్ రేంజ్ లో పరీక్షించారు. సాంకేతిక బదిలీ కింద జరిగిన ఉత్పత్తుల సామర్థ్యాన్ని పరీక్షించడానికి ఈ పరీక్షలను నిర్వహించారు.

స్వదేశంలో అభివృద్ధి చేసిన ప్రాక్సిమిటీ ఫ్యూజ్ల సామర్థ్య పరీక్షలను కూడా నిర్వహించారు. పినాక రాకెట్ వ్యవస్థలో ఉపయోగించే వివిధ ఫ్యూజులను పూణే కు చెందిన ఆర్మమెంట్ రీసెర్చ్ అండ్ డెవలప్ మెంట్ ఎస్టాబ్లిష్ మెంట్ అభివృద్ధి చేసింది. తొలుత వీటి రూపకల్పన పరీక్షలను నిర్వహించడం జరిగింది. వీటి సామర్థ్యం పరీక్షలు విమానంలో జరిగాయి. విమానం ద్వారా నిర్వహించిన సామర్థ్య పరీక్షలు విజయవంతం అయ్యాయి.

దేశంలోనే తొలిసారిగా ప్రత్యేకంగా చేపట్టిన పరిశోధన, అభివృద్ధి కార్యక్రమాల ద్వారా ఈ వ్యవస్థలను అభివృద్ధి చేశారు. దేశీయంగా అభివృద్ధి చేయబడిన ఫ్యూజులు దిగుమతి చేసుకున్న ఫ్యూజుల స్థానంలో ఉపయోగిస్తారు. దీనివల్ల విలువైన విదేశీ మారకద్రవ్యం ఆదా అవుతుంది. ఏడీఎం ల కోసం ఆర్మమెంట్ రీసెర్చ్ అండ్ డెవలప్ మెంట్ ఎస్టాబ్లిష్ మెంట్ సూక్ష్మీకరించిన ఫ్యూజులను రూపొందించింది. డ్యూయల్-పర్ఫెన్ డైరెక్ట్-యాక్షన్ సెల్ఫ్ డిస్ట్రక్షన్, యాంటీ-ట్యాంక్ మ్యూనిషన్ ఫ్యూజుల పనితీరు ప్రస్తుత పరీక్షల్లో విశ్లేషించారు. అన్ని పరీక్షలు విజయవంతం అయ్యాయి.

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Press Information Bureau
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Ministry of Defence

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DRDO & Indian Air Force successfully flight-test indigenous Stand-off Anti-Tank Missile

Defence Research and Development Organisation (DRDO) and Indian Air Force (IAF) flight-tested the indigenously designed and developed Helicopter launched Stand-off Anti-tank (SANT) Missile from Pokhran ranges on December 11, 2021. The flight-test was successful in meeting all its mission objectives. The release mechanism, advanced guidance and tracking algorithms, all avionics with integrated software, performed satisfactorily and tracking systems monitored all mission events. The missile is equipped with a state-of-the-art MMW seeker which provides high precision strike capability from a safe distance. The weapon can neutralise targets in a range up to 10 kms.



The SANT missile has been designed and developed by Research Centre Imarat (RCI), Hyderabad in coordination with other DRDO labs and participation from industries. This is the third in the series of indigenous stand-off weapons to be tested in recent times after long range bomb and smart anti airfield weapon for strengthening the arsenal of IAF. The indigenous development of various configurations for different applications with advanced technologies is a firm march towards 'Aatmanirbharta' in defence.

Raksha Mantri Shri Rajnath Singh has congratulated the team associated with the mission. Secretary Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy said the successful flight test of SANT missile would further bolster the indigenous defence capabilities.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1780481>



पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

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रक्षा अनुसंधान एवं विकास संगठन और भारतीय वायु सेना ने स्वदेश में ही निर्मित स्टैंड-ऑफ एंटी टैंक मिसाइल का सफलतापूर्वक परीक्षण किया

रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) और भारतीय वायु सेना (आईएएफ) ने 11 दिसंबर 2021 को पोखरण रेंज में स्वदेशी रूप से डिजाइन और विकसित हेलीकॉप्टर लॉन्च स्टैंड-ऑफ एंटी-टैंक (एसएएनटी) मिसाइल का सफलतापूर्वक परीक्षण किया। यह परीक्षण सभी मायनों में सफल रहा है और इसने सभी उद्देश्यों को पूरा किया। मिसाइल के रिलीज मैकेनिजम, एडवांस गाइडेंस सिस्टम, ट्रैकिंग एल्गोरिदम और एकीकृत सॉफ्टवेयर के साथ सभी वैमानिकी प्रणालियों ने संतोषजनक ढंग से प्रदर्शन किया

और ट्रैकिंग सिस्टम ने मिशन से जुड़ी सभी घटनाओं की निगरानी की। मिसाइल एक अत्याधुनिक एमएमडब्ल्यू तकनीक से लैस है जो सुरक्षित दूरी बनाए रखते हुए उच्च परिशुद्धता के साथ हमला करने की क्षमता प्रदान करती है। यह हथियार 10 किलोमीटर तक की सीमा में लक्ष्य को नष्ट करने की काबिलियत रखता है।

स्टैंड-ऑफ एंटी-टैंक मिसाइल को हैदराबाद के अनुसंधान केंद्र (आरसीआई) और डीआरडीओ की प्रयोगशालाओं के समन्वय एवं उद्योगों की भागीदारी के साथ डिजाइन तथा विकसित किया



गया है। भारतीय वायु सेना की मारक क्षमता और ज्यादा मजबूत बनाते हुए लंबी दूरी के बम तथा स्मार्ट एंटी एयरफील्ड हथियार के बाद हाल के दिनों में परीक्षण किए जाने वाले स्वदेशी स्टैंड-ऑफ हथियारों की श्रृंखला में यह तीसरी मिसाइल है। उन्नत प्रौद्योगिकियों के साथ विभिन्न अनुप्रयोगों के लिए इन सभी प्रणालियों का स्वदेशी विकास रक्षा क्षेत्र में 'आत्मनिर्भर भारत' की दिशा में एक और महत्वपूर्ण कदम है।

रक्षा मंत्री श्री राजनाथ सिंह ने मिशन से जुड़ी टीम को बधाई दी है। रक्षा अनुसंधान एवं विकास विभाग के सचिव और डीआरडीओ के अध्यक्ष डॉ. जी सतीश रेड्डी ने कहा है कि इस मिसाइल के सफलतापूर्वक परीक्षण से स्वदेशी रक्षा क्षमताओं को और अधिक बढ़ावा मिलेगा।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1780552>



రక్షణ మంత్రిత్వ శాఖ

Sat, 11 Dec 2021 5:49PM

స్వదేశీ స్టాండ్ -ఆఫ్ యాంటీ ట్యాంక్ క్షిపణిని విజయవంతంగా పరీక్షించిన డిఆర్డిఓ & భారత వైమానిక

దేశీయంగా రూపొందించి, అభివృద్ధి చేసిన హెలికాప్టర్ లాండ్ స్టాండ్ ఆఫ్ యాంటీ ట్యాంక్ (ఎస్ఎఎన్టి) క్షిపణిని డిఫెన్స్ రీసెర్చ్ అండ్ డెవలప్ మెంట్ ఆర్గనైజేషన్ (డిఆర్డిఓ), భారత వైమానిక దళం (ఐఎఎఫ్) పోఖ్రాన్ శ్రేణుల నుంచి డిసెంబర్ 11, 2021న పరీక్షించాయి.

తన మిషన్ లక్ష్యాలను నెరవేర్చడంలో విమాన పరీక్ష (ఫ్లైట్ టెస్ట్) విజయవంతం అయింది. రిలీజ్ మెకానిజం (విడుదల యంత్రాంగం), అడ్వాన్స్డ్ గైడెన్స్, (అధునాతన మార్గదర్శకత్వం), ట్రాకింగ్ ఆల్గోరిథమ్స్ (అనుగామి యాంత్రిక పద్ధతి), సమీకృత సాఫ్ట్వేర్ తో కూడిన ఏవియానిక్స్ సంతృప్తికరంగా పని చేయడంతో పాటుగా అనుగామి వ్యవస్థలు ఈ మిషన్ కార్యాలను పర్యవేక్షించాయి. అత్యాధునిక ఎంఎండబ్ల్యు అమర్చిన ఈ క్షిపణి, సుదూర తీరం నుంచి అత్యంత కచ్చితంగా లక్ష్యాన్ని ఛేదించగల సామర్థ్యాన్ని అందిస్తుంది. ఈ ఆయుధం 10 కిమీల పరిధిలోని లక్ష్యాలను నిర్వీర్యం చేయగలదు.

ఎస్ఎఎన్టి క్షిపణిని రీసెర్చ్ సెంటర్ ఇమారత్ (ఆర్సిఐ), హైదరాబాదు ఇతర డిఆర్డిఓ ప్రయోగశాలల సహకార సమన్వయం, పరిశ్రమల భాగస్వామ్యంతో రూపొందించి, అభివృద్ధి చేసింది. ఇటీవలి కాలంలో దీర్ఘ పరిధి బాంబు, స్కార్ప్ యాంటీ ఎయిర్ ఫీల్డ్ ఆయుధం తర్వాత ఐఎఎఫ్ ఆయుధశాలను బలోపేతం చేసేందుకు దేశీయంగా తయారు చేసిన స్టాండ్ ఆఫ్ ఆయుధ పరీక్షల శ్రేణిలో ఇది మూడవది.

అధునాత సాంకేతికలతో భిన్న అప్లికేషన్ల కోసం వివిధ కన్ఫిగరేషన్ల (రూపురేఖ)లను దేశీయంగా అభివృద్ధి చేయడమన్నది రక్షణలో ఆత్మనిర్భర భారత్ దేశంగా దృఢంగా సాగడమే. ఈ మిషన్ తో సంబంధం కలిగి ఉన్న బృందాన్ని రక్షణ మంత్రి రాజ్ నాథ్ సింగ్ అభినందించారు. ఎస్ఎఎన్టి క్షిపణి విజయవంతమైన ఫ్లైట్ టెస్ట్ దేశీయ రక్షణ సామర్థ్యాలను మరింత బలోపేతం చేస్తుందని, రక్షణ శాఖ ఆర్&డి కార్యదర్శి, డిఆర్డిఓ చైర్మన్ జి. సతీష్ రెడ్డి పేర్కొన్నారు.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1780622>



Export of Defence Equipment

Since 2016-17 to 2018-19, the Defence Exports increased by almost seven times. The details of exports of last five years are as follows:

	2016-17	2017-18	2018-19	2019-20	2020-21
Total Export value (in Crores)	1521.91	4682.36	10745.77	9115.55	8434.84

Many reforms/steps have been taken to boost Defence exports and bring ease of doing business in recent times. There are:

- i. Special Chemicals, Organisms, Materials, Equipment and Technologies (SCOMET) Category 6 titled “Munitions List” that was hitherto “Reserved” has been populated and Military Stores list notified vide Notification No.115(RE-2013)/2009-2014 dated 13th March 2015 stands rescinded.
- ii. The Director General of Foreign Trade (DGFT) vide Public Notice No. 4/2015-20 dated 24th April, 2017 has delegated its authority and notified Department of Defence Production (DDP) as the Licensing Authority for export items in Category 6 of SCOMET. The export of items specified in Category 6 (Munitions List) except those covered under Notes 2 & 3 of Commodity Identification Note (CIN) of the SCOMET is now governed by the Standard Operating Procedure issued by the Department of Defence Production (DDP), Ministry of Defence.
- iii. Standard Operating Procedure (SOP) for the export of munitions list items have been simplified and placed on the website of the DDP.
- iv. A completely end-to-end online portal for receiving and processing export authorisation permission has been developed. The applications submitted on this portal are digitally signed and the authorisation are also issued digitally, at faster pace.
- v. In repeat orders of same product to the same entity, consultation process has been done away with and permission is issued immediately. For the repeat order of same product to different entity, the consultation earlier done with all stakeholders is now limited only with MEA.
- vi. In Intra-Company business (which is especially relevant for outsourcing of work by defence related parent company abroad to its subsidiary in India), the earlier requirement of getting End User Certificate (EUC) from the Government of importing country has been done away with and ‘Buying’ Company is authorized to issue the EUC.
- vii. The requirement of Government signed EUC in cases of providing engineering services (ToT related to Munitions List) to Wassenaar Arrangement (WA) Countries has been dispensed with.
- viii. Legitimate export of systems/platforms for civil end use to WA Member countries is considered subject to submission of EUC or import certificate or equivalent document issued by the Government of importing country.
- ix. The legitimate export of the parts and components of small arms and body armour for civil use are now being permitted after prior consultation with MEA.

- x. For export of items for exhibition purposes, the requirement of consultation with stakeholders has been done away with (except for select countries).
- xi. Powers have been delegated to DRDO and CMDs of DPSUs for exploring export opportunities and participation in global tenders.
- xii. New simplified End User Certificate Format for Parts & Components has been provided in SOP.
- xiii. Validity of Export Authorization for export of parts & components has been increased from 02 years to date of completion of order/component whichever is later.
- xiv. A new provision for re-exporting parts and components for undertaking repair or rework to provide replacement for a component under warranty obligation is inserted in the SOP as a sub-classification of repeat orders.
- xv. MHA vide Notification dated 1.11.2018 has delegated its powers to Department of Defence Production to issue export license under Arms Rules 2016 in Form X-A, for parts & components of small arms. With this the Department of Defence Production becomes the single point of contact for exporter for export of parts and components of Small Arms & Ammunitions.
- xvi. The Government has notified the Open General Export License (OGEL) - a one time export license, which permits the industry to export specified items to specified destinations, enumerated in the OGEL, without seeking export authorisation during the validity of the OGEL. OGEL has been integrated with end to end online Portal.
- xvii. Scheme for Promotion of Defence Exports has been notified to provide an opportunity to the prospective exporters an option to get their product certified by the Govt. and provides access to the testing infrastructure of Ministry of Defence for initial validation of the product and its subsequent field trials. The certificate can be produced by the prospective exporter for marketing their products suitably in the global market.
- xviii. A separate Cell has been formed in the Department of Defence Production to co-ordinate and follow up on export related action including enquiries received from various countries, sharing the leads with private sector & public sector companies and facilitate exports.
- xix. In order to boost defence exports, regular webinars are being organized with Friendly Foreign Countries (FFCs) under the aegis of DDP, MoD through Indian Missions abroad and Industry Associations with active participation from Indian Defence Industries.
- xx. A Scheme to provide financial support to Defence Attaches for taking up actions for promoting exports of India made defence products both of public and private sector in the countries to which they are attached has been notified.

Export of Munitions List Items specified in Category 6 of Special Chemicals, Organisms, Materials, Equipment and Technologies (SCOMET) is restricted. DGFT has delegated powers to Department of Defence Production to grant authorisation for export of items covered in Category 6 of SCOMET. The authorisation for export of items covered in Category 6 of SCOMET is granted in accordance with the provisions of the Standard Operating Procedure issued by the Department of Defence Production (DDP), Ministry of Defence.

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Shri Manoj Kotak and others in Lok Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1780095>

Extended Range Pinaka rocket system successfully test-fired

Synopsis

While the Pinaka MK-I rocket system has a range of around 40 km, the Pinaka II variant can hit targets at a distance of 60 km. The range of the Pinaka-ER (MK-I variant is not immediately known.)

A series of successful test-firing of the Extended Range Pinaka rocket system (Pinaka-ER) was carried in the last three days, the defence ministry said on Saturday.

The rocket systems that were tested at Pokharan field firing ranges were manufactured by a private industry following transfer of technology by the Defence Research and Development Organisation (DRDO).

"The DRDO, along with the Army, conducted series of performance evaluation trials of these industry produced rockets at field firing ranges during the last three days," the defence ministry said.

"In these trials, enhanced range Pinaka rockets were test-fired at different ranges with various warhead capabilities. All the trial objectives were met satisfactorily," it said in a statement.

While the Pinaka MK-I rocket system has a range of around 40 km, the Pinaka II variant can hit targets at a distance of 60 km. The range of the Pinaka-ER (MK-I variant is not immediately known).

The ministry said the Area Denial Munition (ADM) variants of the munition for Pinaka, produced under the technology transfer, were also tested successfully at Pokhran field firing ranges.

It said 24 rockets were fired for different ranges and warhead capabilities.

"With this, the initial phase of technology absorption of Pinaka-ER by the industry partner has successfully been completed making the industry partner ready for series production of the rocket system," the ministry said.

The rocket system has been jointly designed by two Pune-based DRDO laboratories -- the Armament Research and Development Establishment (ARDE) and the High Energy Materials Research Laboratory (HEMRL).

The ministry said DRDO, after establishing the performance efficacy of the Pinaka-ER, transferred its technology to the industry.

"The industry partner has manufactured enhanced Pinaka Mk-1 rockets with DRDO's handholding during the production and quality assurance," it said.

"In continuation of the transfer of technology absorption, rockets developed by the industry have undergone the performance evaluation and quality certification process," the ministry said.

It said the indigenously-developed "proximity fuzes" for Pinaka rockets have also been tested.

"After design validation trials, dynamic performance evaluation of these fuzes have been evaluated with flight testing. Consistency in performance of fuzes has been established in consecutive flight trials," the ministry said.

<https://economictimes.indiatimes.com/news/defence/drdo-successfully-tests-extended-range-pinaka-at-pokhran-range/articleshow/88220393.cms>



Watch: DRDO successfully tests Pinaka-ER Multi Barrel Rocket Launcher system

Pinaka extended range rocket system successfully tested: DRDO

Initial phase of technology absorption by industry partner completed, it says

New Delhi: Successful tests of Pinaka Extended Range (ER) multi-barrel rocket launcher system, Area Denial Munitions (ADM) and indigenously developed fuses have been carried out at various test ranges, the Defence Research and Development Organisation (DRDO) said on Saturday.

“The DRDO, along with the Army, conducted a series of performance evaluation trials of these industry produced rockets at field firing ranges during the last three days,” it said in a statement. “In these trials, enhanced range Pinaka rockets were test-fired at different ranges with various warhead capabilities. All the trial objectives were met satisfactorily.”

The DRDO said 24 rockets were fired for different ranges and warhead capabilities to meet the objectives of accuracy and consistency. With this, the initial phase of technology absorption of Pinaka-ER by the industry partner has successfully been completed making the industry partner ready for series production of the rocket system, it said.

The technology of the Pinaka ER rockets was transferred by the DRDO to the industry partner, which manufactured the enhanced Pinaka Mk-1 rockets with DRDO’s handholding during the production and quality assurance. The hand holding during the production, quality assurance and launch coordination for bulk production is being provided by the DRDO design team and QA agencies nominated for the system, it said.

The Pinaka-ER is the upgraded version of earlier version which has been in service with the Army for the last decade.

The ADM variants of munition designed by the Armament Research & Development Establishment (ARDE), Pune for Pinaka and manufactured by the industry partner were also successfully carried out at Pokhran range as part of performance evaluation trials under technology absorption.

In addition, proximity fuses for Pinaka rockets developed by the ARDE, Pune, have also been tested. Stating that after design validation trials, dynamic performance evaluation of these fuses has been evaluated with flight testing, the DRDO said consistency in performance of fuses has been established in consecutive trials. The fuses were developed for the first time in the country and will replace the imported fuses and save foreign exchange, it said.

The ARDE has also designed miniaturised fuses for the ADMs which include dual-purpose direct-action self-destruction fuses and anti-tank munition fuses which were also successfully tested.

<https://www.thehindu.com/news/national/pinaka-extended-range-rocket-system-successfully-tested-drdo/article37932502.ece>



Pokhran: The Pinaka-ER Multi Barrel Rocket Launcher System being successfully tested at Pokhran range. | Photo Credit: PTI

Upgraded Pinaka rocket system with extended range successfully tested in Pokhran: Defence ministry

Over the last three days, a series of successful tests of the enhanced range Pinaka rocket launcher system were conducted at the Pokhran range.

By Abhishek Bhalla

New Delhi: Over the last three days, a series of successful tests of the enhanced range Pinaka rocket launcher system were conducted at the Pokhran range.

In an official statement, the Ministry of Defence said, "The DRDO, along with the Army, conducted a series of performance evaluation trials. In these trials, enhanced range Pinaka rockets were test-fired at different ranges with various warhead capabilities. All the trial objectives were met satisfactorily. 24 rockets were fired for different ranges and warhead capabilities to meet the objectives of accuracy and consistency."

With this, the initial phase of technology absorption of the Pinaka-ER (enhanced range) by the industry partner has successfully been completed, making the upgraded rocket system ready for production, the ministry added.

What is Pinaka-ER?

The Pinaka-ER is the upgraded version of the earlier Pinaka, which has been in service with the Indian Army for the last decade. The system has been designed in light of emerging requirements with advanced technologies. The extended range of the new Pinaka is over 70 km, as opposed to the 45 km the system currently has.

Pinaka is an all-weather, artillery multi-barrel rocket system. It can fire 72 rockets in 44 seconds. It delivers lethal and responsive fire against a variety of area targets such as exposed enemy troops, armoured and soft skin vehicles, communication centres, air terminal complexes, fuel and ammunition dumps.

The Pinaka gives a deep strike option to the forces on the ground and is capable of hitting critical military installations.

The Pinaka rocket system was recently deployed at the China border amid tensions that began in Ladakh in May last year.

The system was jointly designed by laboratories of Defence Research and Development Organisation (DRDO) - Armament Research & Development Establishment (ARDE), Pune and High Energy Materials Research Laboratory (HEMRL), Pune.

The Area Denial Munition (ADM) variants designed by ARDE and manufactured by industry partners under technology transfer were successfully carried out at Pokhran Field Firing Ranges. These trials are part of performance evaluation under technology absorption.

The indigenously-developed proximity fuzes for Pinaka rockets have also been tested.

<https://www.indiatoday.in/india/story/pinaka-rocket-system-extended-range-tested-pokhran-defence-ministry-1886686-2021-12-11>



Over the last three days, a series of successful tests of the enhanced range Pinaka rocket launcher system were conducted at the Pokhran range.

Pinaka extended range rocket ready for production after successful tests at different ranges

As many as 24 rounds of the Area Denial Munition (ADM) variant of the weapon system with new indigenously developed fuzes were tested for various strike ranges at Pokhran in the last three days

By Hemant Kumar Rout

Bhubaneswar: In another boost to the Atmanirbhar Bharat initiative, India successfully test-fired multiple rounds of Pinaka Extended Range (Pinaka-ER) rocket systems that can act as short-range missiles confirming that the weapon is ready for series production.

As many as 24 rounds of the Area Denial Munition (ADM) variant of the weapon system with new indigenously developed fuzes were tested for various strike ranges at Pokhran in the last three days.

The Defence Research and Development Organisation (DRDO) along with the Army conducted the series of performance evaluation trials of the recently produced rockets with various warhead capabilities at field firing ranges in desert conditions.

The ADM variants of munition has been designed by the Armament Research & Development Establishment (ARDE), Pune, for Pinaka and manufactured by the industry partners under technology transfer. These trials were part of performance evaluation under technology absorption.

"All the trial objectives were met satisfactorily. The rockets were fired for different ranges and warhead capabilities to meet the objectives of accuracy and consistency. With this, the initial phase of technology absorption of Pinaka-ER by the industry partner has successfully been completed making it ready for series production," said a defence official.

The Pinaka-ER is the upgraded version of the earlier Pinaka version which has been in service with the Indian Army for over a decade. The system has been designed in the light of emerging requirements with advanced technologies enhancing the range.

The DRDO, after establishing the performance efficacy of the enhanced range Pinaka, transferred the technology of the system to the industry. The industry partner has manufactured enhanced Pinaka Mk-1 rockets with DRDO's hand-holding during the production and Quality Assurance (QA).

In continuation of the Transfer of Technology (ToT) absorption, rockets developed by the industry have undergone the performance evaluation and quality certification process. The hand-holding during the production, quality assurance and launch coordination for bulk production is being provided by the DRDO design team and QA agencies nominated for the system.

The indigenously-developed proximity fuzes for Pinaka rockets were also tested. The fuzes have been developed through dedicated indigenous R&D efforts for the first time in the country. The indigenously developed fuzes will replace the imported fuzes and save foreign exchange.

The ARDE has also designed miniaturised fuzes for ADMs and developed different fuzes for the Pinaka rocket for different types of applications. After design validation trials, dynamic performance evaluation of the fuzes were evaluated with flight testing. Consistency in performance of fuzes has been established in consecutive flight trials.



The extended range Pinaka rocket system being test-fired from the Pokhran range (Photo | Special arrangement)

"Performance of dual-purpose Direct-Action Self Destruction (DASD) and Anti-Tank Munition (ATM) fuzes were evaluated during the current flight trials and the results were satisfactory. All the mission objectives were successfully met in all the above trials," the defence official added.

The Multi Barrel Rocket Launcher System has been jointly designed by laboratories of the Defence Research and Development Organisation (DRDO) - ARDE and High Energy Materials Research Laboratory (HEMRL) at Pune.

The enhanced range version of the Pinaka system can destroy targets at distances up to 45 km. The 15-foot long rocket weighs around 280 kg and can carry warheads up to 100 kg.

<https://www.newindianexpress.com/nation/2021/dec/11/pinaka-extended-range-rocket-ready-for-production-after-successful-tests-at-different-ranges-2394423.html>



Sun, 12 Dec 2021

Jagran Explainer: How the upgraded Pinaka rocket system is different from previous variants

The Pinaka multi-barrel rocket launcher has been developed by the DRDO, ARDE and HEMRL for the Indian Army. The upgraded Pinaka system or Pinaka-ER has a longer range with reduced length compared to the earlier versions of the rocket launcher.

New Delhi: In yet another boost to 'Make in India' and 'Aatmanirbhar Bharat', the Defence Research and Development Organisation (DRDO) successfully tested the Extended Range Pinaka (Pinaka-ER) Multi Barrel Rocket Launcher System at the Pokhran Range in Rajasthan, said the Union Defence Ministry on Saturday.

"The DRDO, along with the Army, conducted series of performance evaluation trials of these industry produced rockets at field firing ranges during the last three days," the Defence Ministry said in a press release. "In these trials, enhanced range Pinaka rockets were test-fired at different ranges with various warhead capabilities. All the trial objectives were met satisfactorily".



Pic credits: PIB

What is Pinaka multi-barrel rocket launcher system?

The Pinaka multi-barrel rocket launcher has been developed by the DRDO, the Armament Research & Development Establishment (ARDE) and the High Energy Materials Research Laboratory (HEMRL) for the Indian Army. Pinaka Mark-I had a range of 40 km and its enhanced version could fire missiles up to 60 km.

The Mark-II and Mark-II ER have a range of 60 km and 90 km respectively. Each Pinaka battery consists of six launcher vehicles that are loaded with 12 rockets. The DRDO claims that one Pinaka battery can wipe out targets in 8 sq.km area.

How the upgraded Pinaka system is different from previous versions?

The upgraded Pinaka system or Pinaka-ER has a longer range with reduced length compared to the earlier versions of the rocket launcher. Though the range of Pinaka-ER has not been revealed by the Defence Ministry yet, it "has been designed in the light of emerging requirements with advanced technologies enhancing the range".

"The successful tests are an important step towards achieving the goal of self-reliance in the defence sector, and have paved the way for the induction of the weapons into the armed forces," *Hindustan Times* quoted DRDO Chief G Satheesh Reddy as saying.

<https://english.jagran.com/india/jagran-explainer-how-the-upgraded-pinaka-rocket-system-is-different-from-previous-variants-10036206>

In self-reliance boost, India tests new anti-tank missile, longer range rockets

The DRDO and Indian Air Force flight-tested the indigenously designed and developed SANT at Pokhran firing range on Saturday.

By Rahul Singh

India on Saturday successfully tested a new locally-developed anti-tank missile and concluded a series of tests of extended range rockets also developed indigenously, weapons that will be inducted into the armed forces shortly, officials familiar with the developments said.

The weapons successfully tested were the helicopter launched stand-off anti-tank (SANT) missile and Pinaka extended range (ER) rocket systems. “The successful tests are an important step towards achieving the goal of self-reliance in the defence sector, and have paved the way for the induction of the weapons into the armed forces,” Defence Research and Development Organisation (DRDO) chief G Satheesh Reddy said.

The DRDO and Indian Air Force flight-tested the indigenously designed and developed SANT at Pokhran firing range on Saturday.

“The test met all mission objectives. The release mechanism, advanced guidance and tracking algorithms, and all avionics with integrated software performed satisfactorily. Tracking systems monitored all mission events,” the defence ministry said in a statement. The weapon has a range of 10 km.

The IAF’s Russian-origin Mi-35 attack helicopters are expected to be equipped with the missile to arm them with the capability to destroy enemy tanks from an improved stand-off range.

The existing Russian-origin Shturm missile on the Mi-35 can target tanks at a range of five km. The other weapons on the gunship include rockets of different calibre, 500 kg bombs, 12.7mm guns, and a 23mm cannon.

The existing anti-tank missiles developed by DRDO --- the Nag and Helina --- have an effective range of under five km. While the Nag missile is launched from a modified infantry combat vehicle (called the Nag missile carrier or Namica) and has a range of four km, the Helina or helicopter-based Nag is for mounting on the Dhruv advanced light helicopter and can strike targets up to five km away.

A series of successful tests of Pinaka ER rocket systems were also carried out over the last week at the Pokhran range. The new rocket system has a longer range with reduced length compared to the earlier variant.

“DRDO, after establishing the performance efficacy of the enhanced range Pinaka, transferred the technology of the system to the industry. The industry partner has manufactured enhanced Pinaka Mk-1 rockets with DRDO’s handholding. Rockets developed by the industry have undergone performance evaluation and quality certification,” the ministry said in another statement.

While Pinaka Mk-1 rockets have a range of 36 km, the ER variant can hit targets more than 48 away and has been developed as per requirements of the Indian Army.

The tests were conducted over the last three days.

“In these trials, as many as 24 rockets were fired for different ranges and warhead capabilities to meet the objectives of accuracy and consistency. With this, the initial phase of technology absorption of Pinaka-ER by the industry partner has been successfully completed, making the partner ready for series production of the rocket system,” the statement added.

<https://www.hindustantimes.com/india-news/in-self-reliance-boost-india-tests-new-anti-tank-missile-longer-range-rockets-101639243242653.html>

DRDO, IAF successfully flight-test indigenous Stand-off Anti-Tank missile

The SANT missile's flight test is the third in the series of indigenous stand-off weapons to be tested in recent times after the Long-Range Bomb and Smart Anti-Airfield Weapon (SAAW).

By Manjeet Negi

The Defence Research and Development Organisation (DRDO) and the Indian Air Force (IAF) on Saturday successfully flight-tested the indigenously designed and developed helicopter launched Stand-off Anti-Tank (SANT) missile from Pokhran range.

The missile is equipped with a state-of-the-art millimetre wave (MMW) seeker which provides high precision strike capability from a safe distance. The weapon can neutralise targets at a range up to 10 kilometres.

"The flight-test was successful in meeting all its mission objectives. The release mechanism, advanced guidance and tracking algorithms, all avionics with integrated software, performed satisfactorily and tracking systems monitored all mission events," the Ministry of Defence said in a statement.

The SANT missile has been designed and developed by Research Centre Imarat (RCI), Hyderabad in coordination with other DRDO labs and participation from industries.

This is the third in the series of indigenous stand-off weapons to be tested in recent times, after the Long-Range Bomb and Smart Anti-Airfield Weapon (SAAW), further strengthening the arsenal of the Indian Air Force.

"The indigenous development of various configurations for different applications with advanced technologies is a firm march towards 'Aatmanirbharta' in defence," the statement added.

DRDO chairman Dr G Satheesh Reddy said that the successful flight test of the SANT missile will further bolster the indigenous defence capabilities.

<https://www.indiatoday.in/india/story/drdo-iaf-flight-test-indigenous-stand-off-anti-tank-missile-1886763-2021-12-11>



DRDO and IAF successfully flight-tested indigenous Stand-Off Anti-Tank (SANT) missile on December 11. (Photo: PIB)

Explained: From Pokhran to Chandipur, how December missile tests flex Made-in-India muscle

Multiple tests carried out starting December 7 provide a boost to the Make in India endeavour in defence production

A slew of tests starting early December saw indigenously developed weapons systems and devices meet key objectives and parameters as India focuses on domestic capabilities in defence production. There was something in these tests for all the three services with the advanced weaponry set to boost capabilities of the army, navy and air force.

What is the Vertical Launch-Short Range Surface to Air Missile?

Its first trial was held in February this year and the December 7 launch from the Integrated Test Range at Chandipur off the coast of Odisha was a “confirmatory trial to prove the consistent performance” of the missile known as VL-SRSAM.

The purpose behind the test was aimed at signing off on the “configuration and integrated operation” so as to pave the way for its deployment onboard Indian Navy ships. The test went into the function of all the weapon system components involved, “including the vertical launcher unit with controller, canisterised flight vehicle... required for future launches of the missile from Indian Naval ships”, the Defence Ministry said.

Reports said that the missile has an operational range of 50-60 km and features mid-course inertial guidance through fibre optic gyros (FOG) and active radar homing in terminal phase. The FOG navigation system, DRDO said, has been integrated with satellite based receivers and was “developed in-house to meet the requirements of various projects”.

The VL-SRSAM has been designed and developed by DRDO for the Indian Navy and is meant for “neutralising various aerial threats at close ranges, including sea-skimming targets”, the ministry had said after the February test, adding that scientists from various DRDO labs were involved in the project like the Defence Research and Development Laboratory (DRDL), Research Centre Imarat (RCI), both located in Hyderabad, and R&D Engineers, Pune.

The ministry said that the missile system will boost the Navy’s defensive ability against aerial threats. The December 7 trial was conducted from a vertical launcher against an electronic target at a very low altitude and all the weapons sub-systems performed as per expectation, it added.

What was the BrahMos Missile test?

On December 8, the Defence Ministry said that it had undertaken a test, again at the Chandipur facility, of the air version of the BrahMos supersonic



The VL-SRSAM enhances Navy’s capabilities to take on aerial targets



The Pinaka extended range system was tested at Pokhran and paves the way for the industry partner to undertake series production of the rocket system. (Photo: Ministry of Defence)



DRDO said that the helicopter-launched missile was designed and developed by Research Centre Imarat (RCI), Hyderabad, in coordination with other DRDO labs and participation from industries. (Photo: Ministry of Defence)

cruise missile. The missile — developed as part of a joint venture between India and Russia — was successfully test fired from the supersonic Sukhoi 30 MK-I fighter jet and the “copybook flight” saw the missile follow “the pre-planned trajectory meeting all mission objectives”.

The ministry said that the latest test — BrahMos has already been integrated into the Indian armed forces — was “a major milestone in the BrahMos development” as it clears the decks for “serial production of air-version BrahMos missiles within the country”. This test of the BrahMos’ air version follows one held in July this year.

Several key components of the missile — metallic and non-metallic airframe sections comprising its ramjet fuel tank and pneumatic fuel supply system that are an integral part of the ramjet engine — are “indigenously developed by Indian industry”, the ministry said, adding that the test proved the “structural integrity and functional performance” of the components.

DRDO chief Dr G Satheesh Reddy said various labs of DRDO, academic institutions, quality assurance and certification agencies, public sector undertakings and the Indian Air Force were involved in the development, testing, production and induction of this “complex missile system”.

According to DRDO BrahMos is a “universal, long-range supersonic cruise missile system that can be launched from land, sea and air”. So far, the system had two variants — for anti-ship and land-attack roles, operational with the Indian Navy and Indian Army — and the latest test leads to the induction of its air-launched version. Reports say that the BrahMos missiles can carry a payload of between 200-300kg and have a “range of between 300-500 km depending on which variant and launch platform is used”.

Why is the Extended Range Pinaka Rocket Test Important?

The Pinaka Extended Range (ER) trial announced on December 11 involved testing the version of the multi-barrel rocket launcher system that was manufactured by an industry partner following technology transfer and handholding by the DRDO.

The Defence Ministry said that following a series of tests at Pokhran held over three days, “the initial phase of technology absorption of Pinaka-ER by the industry partner has successfully been completed” and the industry partner is now “ready for series production of the rocket system”.

The Pinaka system is jointly designed by DRDO, the Armament Research & Development Establishment (ARDE) and the High Energy Materials Research Laboratory (HEMRL), both located in Pune. The ministry said that after establishing the performance efficacy of Pinaka ER, DRDO had transferred the technology to the industry and the industry partner manufactured the enhanced Pinaka Mk-1 rockets, which have now undergone performance evaluation and quality certification process.

DRDO says that the Pinaka system features free-flight artillery rockets that have a maximum range of 38km and come with different types of warhead and fuzes along with a multi-tube launcher vehicle, etc. It has two pods containing six rockets each and is capable of firing in salvo mode within 48 seconds. A Pinaka Mk-II rocket, too, has been developed with 60km range.

Alongside the Pinaka ER, which is the upgraded version of the earlier Pinaka that has been in service with the Indian Army for the last decade, indigenously-developed proximity fuzes for the rockets, too, were tested. A fuze is a device, with safety built in, that detonates a munition’s explosive material. The Defence Ministry said that ARDE has developed different fuzes for Pinaka for different types of applications and these have been “developed through dedicated indigenous R&D efforts for the first time in the country”.

What is A Stand-off Anti-Tank Missile?

On December 11, DRDO joined hands with IAF to test the helicopter-launched ‘Stand-off Anti-tank’ (SANT) missile at Pokhran. The test of the “indigenously designed and developed” missile was successful and met all mission objectives.

“The release mechanism, advanced guidance and tracking algorithms, all avionics with integrated software performed satisfactorily and tracking systems monitored all mission events,” the Defence Ministry said. The missile packs a state-of-the-art millimetre wave (MMW) seeker

that “provides high-precision strike capability from a safe distance”, it said and allows it to “neutralise targets in a range up to 10km”.

RCI, Hyderabad, designed and developed the SANT missile, coordinating for the purpose with other DRDO labs while domestic industries, too, participated in the process. The ministry said that this is the “third in the series of indigenous stand-off weapons to be tested in recent times after long-range bomb and smart anti-airfield weapon” for IAF.

“The indigenous development of various configurations for different applications with advanced technologies is a firm march towards ‘Aatmanirbharta’ in defence,” the ministry said in a press statement.

<https://www.news18.com/news/explainers/explained-from-pokhran-to-chandipur-how-december-missile-tests-flexed-made-in-india-muscle-4546685.html>



Sun, 12 Dec 2021

Explained: What is the vertical launch surface to air missile that India has successfully test-fired?

The Vertical Launch Short Range Surface to Air Missile (VL-SRSAM) designed for Indian Naval warships was successfully flight tested this week. What is the missile system about, its latest test and its strategic significance?

By Sushant Kulkarni

Pune: The Vertical Launch Short Range Surface to Air Missile (VL-SRSAM) designed for Indian Naval warships was successfully flight tested earlier this week by India for the second consecutive time since February earlier this year. What is the missile system about, its latest test and its strategic significance?

What is VL-SRSAM?

VL-SRSAM has been designed and developed jointly by three facilities of the Defence Research and Development Organisation for deployment of Indian Naval warships. The missile has the capability of neutralising various aerial threats at close ranges including sea-skimming targets. The tactic of sea skimming is used by various anti-ship missiles and some fighter jets to avoid being detected by the radars onboard warships. For this, these assets fly as close as possible to sea surface and thus are difficult to detect and neutralise.

The design of VL-SRSAM

The missile has been designed to strike at the high-speed airborne targets at the range of 40 to 50 km and at an altitude of around 15 km. DRDO officials have said its design is based on Astra missile which is a Beyond Visual Range Air to Air missile.

Two key features of the VL-SRSAM are cruciform wings and thrust vectoring. The cruciform wings are four small wings arranged like a cross on four sides and give the projective a stable aerodynamic posture. The thrust vectoring is an ability to change the direction of the thrust from its engine control the angular velocity and the attitude of the missile, an official said.

The key DRDO facilities that contributed to the development of the system are Defence Research and Development Laboratory (DRDL) and Research Centre Imarat (RCI), both from Hyderabad, and Research & Development Establishment (Engineers) based in Pune.



VL-SRSAM has been designed and developed for deployment of Indian Naval warships. (Twitter/@DRDO_India)

VL-SRSAM is a canisterised system, which means it is stored and operated from specially designed compartments. In the canister, the inside environment is controlled, thus making its transport and storage easier and improving the shelf life of weapons

The latest test and strategic significance of the missile

The test on Tuesday, December 7, was conducted from the Integrated Test Range at Chandipur, off the coast of Odisha. The launch was conducted from a vertical launcher against an electronic target at a very low altitude. "The flight path of the vehicle along with health parameters were monitored using a number of tracking instruments deployed by ITR, Chandipur. All sub-systems performed as per expectation." said a press statement from the Ministry of Defence. In its maiden trial held on February 22, the DRDO had tested the weapon system twice.

Tuesday's launch of the system was conducted to validate integrated operation of all weapon system components including the vertical launcher unit with controller, canisterised flight vehicle, weapon control system. The successful testing of these systems was crucial for future launches of the missile from Indian Naval Ships. The test launch was monitored by senior officials from DRDO and the Indian Navy.

A Navy veteran who has served on multiple warships during his career said, "In Naval warfare, a warship has to employ various defence mechanisms to protect itself from anti-ship missiles and adversary aircraft. One of the age-old methods is chaffs — which is a countermeasure technology used worldwide to protect naval ships from enemy's radar and Radio Frequency (RF) missile seekers. Another method is deploying missiles to counter Anti Ship missiles. These systems have to have a swift detection mechanism, quick response, high speed and high manoeuvrability. The VL-SRSAM claims to have all these qualities. However, it will have to undergo tests in different conditions and configurations to be ready for deployment on board Indian Naval Ships."

<https://indianexpress.com/article/explained/what-is-vertical-launch-short-range-surface-to-air-missile-7667344/>

अमर उजाला

Sun, 12 Dec 2021

मिसाइल VL-SRSAM: 15 किलोमीटर दूर से दुश्मन पर कर सकती है हमला, जानें इसकी खूबियां, कैसे करती है काम

सार

भारतीय नौसेना के युद्धपोतों के लिए डिज़ाइन की गई वर्टिकल लॉन्च शॉर्ट रेंज सरफेस टू एयर मिसाइल (VL-SRSAM) का इस सप्ताह सफलतापूर्वक परीक्षण किया गया। मिसाइल प्रणाली क्या है, इसका नवीनतम परीक्षण और इसका रणनीतिक महत्व क्या है? जानिए विस्तार से...

विस्तार

भारत ने मंगलवार को ओडिशा के तट पर चांदीपुर में जमीन से हवा में मार करने वाली 'वर्टिकली शॉर्ट रेंज सरफेस टू एयर मिसाइल'(VL-SRSAM) का सफलतापूर्वक परीक्षण किया। VL-SRSAM को भारतीय नौसेना के लिए स्वदेशी रूप से डिज़ाइन और विकसित किया गया है। रक्षा अनुसंधान और विकास संगठन(डीआरडीओ) के अधिकारियों के अनुसार यह मिसाइल लगभग 15 किमी की दूरी पर स्थित दुश्मन के टारगेट को तबाह कर सकती है। डीआरडीओ के अनुसार मिसाइल को बहुत कम ऊंचाई पर स्थित इलेक्ट्रॉनिक लक्ष्य को ध्वस्त करने के लिए वर्टिकल लॉन्चर से दागा गया था।



जानें VL-SRSAM मिसाइल प्रणाली क्या है?

VL-SRSAM मिसाइल की लॉन्चिंग का मुख्य उद्देश्य भारतीय नौसेना के युद्धपोतों की तैनाती करना है। इस मिसाइल को रक्षा अनुसंधान और विकास संगठन(डीआरडीओ) की तीन सुविधाओं द्वारा संयुक्त रूप से डिजाइन और विकसित किया गया है। मिसाइल में समुद्री-स्किमिंग लक्ष्यों सहित निकट सीमा पर विभिन्न हवाई खतरों को बेअसर करने की क्षमता है। समुद्री स्किमिंग की रणनीति का उपयोग विभिन्न जहाज-रोधी मिसाइलों और कुछ लड़ाकू विमानों द्वारा किया जाता है ताकि युद्धपोतों पर रडार द्वारा पता लगाने से बचा जा सके। यह मिसाइल समुद्र की सतह के बेहद करीब से उड़ान भरती हैं और इस तरह इनका पता लगाना और बेअसर करना मुश्किल होता है।

VL-SRSAM का डिजाइन

इस मिसाइल को 40 से 50 किमी की दूरी पर और लगभग 15 किमी की ऊंचाई पर उच्च गति वाले हवाई लक्ष्यों पर हमला करने के लिए डिजाइन किया गया है। डीआरडीओ के अधिकारियों ने कहा है कि इसका डिजाइन एस्ट्रा मिसाइल पर आधारित है जो कि एक विजुअल रेंज से परे हवा से हवा में मार करने वाली मिसाइल है।

VL-SRSAM मिसाइल की दो प्रमुख विशेषताएं

VL-SRSAM मिसाइल की दो प्रमुख विशेषताएं हैं क्रूसिफॉर्म विंग्स और थ्रस्ट वेक्टरिंग। क्रूसिफॉर्म में पंख चार छोटे पंख होते हैं जो चारों तरफ एक क्रॉस की तरह व्यवस्थित होते हैं और प्रक्षेप्य को एक स्थिर मुद्रा देते हैं। वहीं थ्रस्ट वेक्टरिंग अपने इंजन से कोणीय वेग और मिसाइल को नियंत्रित करने वाले थ्रस्ट की दिशा बदलने में मदद करता है।

VL-SRSAM मिसाइल का रणनीतिक महत्व

अपने करियर के दौरान कई युद्धपोतों पर काम कर चुके नौसेना के एक पूर्व अधिकारी ने कहा कि नौसेना को अपने युद्धपोत को जहाज-रोधी मिसाइलों और विरोधी विमानों से बचाने के लिए विभिन्न रक्षा तंत्रों को नियोजित करना पड़ता है। सदियों पुरानी विधियों में से एक है चैफ्स - जो दुनिया भर में दुश्मन के रडार और रेडियो फ्रीक्वेंसी (आरएफ) मिसाइल से नौसेना के जहाजों की रक्षा के लिए इस्तेमाल की जाने वाली एक काउंटरमेजर तकनीक है। दूसरा तरीका एंटी शिप मिसाइलों का मुकाबला करने के लिए मिसाइलों को तैनात करना है। इन प्रणालियों में एक त्वरित पहचान तंत्र, त्वरित प्रतिक्रिया, उच्च गति और उच्च गतिशीलता होनी चाहिए। VL-SRSAM मिसाइल इन सभी गुणों का दावा करता है। हालांकि, भारतीय नौसेना के जहाजों पर तैनाती के लिए तैयार होने के लिए इसे विभिन्न परिस्थितियों और विन्यासों में परीक्षणों से गुजरना होगा।

<https://www.amarujala.com/india-news/what-is-vl-srsam-missile-know-about-vertical-launch-surface-to-air-missile-that-india-has-successfully-test-fired>

Indian troops deployed in high altitude areas equipped with advanced avalanche alert gadgets: Ministry of Defence

New Delhi: Indian Army troops deployed in high altitude areas are suitably equipped with modern gadgets to include avalanche victim detectors, trackers, and Ricoh reflectors, informed the Ministry of Defence on Friday.

Apart from this, weather conditions in snowbound areas of Jammu and Kashmir are closely monitored by Snow and Avalanche Study Establishment (SASE) stations at Sasoma and Srinagar, said the ministry.

As per the ministry, due cognizance is taken of weather warnings and the same is communicated to troops in real-time.

Defence Geo-Informatics Research Establishment (DGRE) established under the aegis of DRDO has a well-established mechanism to provide advance warning of avalanches in mountain regions to all concerned including BRO.

The establishment has a series of observatories and automated weather stations in the mountain regions which are operational in avalanche-prone areas. DGRE has established 39 observatories in Jammu and Kashmir, Uttarakhand, Himachal Pradesh, and Sikkim, and an additional 10 are being established.

Routine meteorology data collected at these observatories is collated at DGRE, Chandigarh, and based on this an avalanche warning bulletin is subsequently forwarded to all concerned in nearby areas in real-time.

Avalanche warnings issued by DGRE assist troops in operational planning and safeguarding against impending avalanches.

This information was given by the Minister of State for Defence Ajay Bhatt in a written reply to BJP MP from Ladakh, Jamyang Tsering Namgyal in Lok Sabha today.

<https://timesofindia.indiatimes.com/india/indian-troops-deployed-in-high-altitude-areas-equipped-with-advanced-avalanche-alert-gadgets-ministry-of-defence/articleshow/88207625.cms>



(Picture for representation)

Expo to showcase new technologies, products for armed forces

Mysuru: An exhibition to showcase new technologies and products for the armed forces will be held opposite the North Gate of Mysuru Palace (Balarama Jayarama Gate) on December 13 and 14.

According to a statement here, Defence Research and Development Organisation's (DRDO) Defence Food Research Laboratory (DFRL), Mysuru, and Defence Bio-Engineering and Electro-Medical Laboratory (DEBEL), Bengaluru, will be organising the two-day-long "Azadi Ka Amrit Mahotsav" Exhibition to mark 75 years of Independence.

Deputy Commissioner of Mysuru Bagadi Gautham will inaugurate the indoor exhibition while Commissioner of Mysuru City Police Chandragupta will inaugurate the outdoor exhibition at 10 a.m. on December 13.

The exhibition will remain open from 10.30 a.m. to 5 p.m. on both the days. However, admission to the exhibition will be restricted to persons who are fully vaccinated against COVID-19, as per the State Government's directions, said the press statement issued by DRFL in Mysuru.

<https://www.thehindu.com/news/national/karnataka/expo-to-showcase-new-technologies-products-for-armed-forces/article37934111.ece>



Mon, 13 Dec 2021

4 major defence deals inked by India in 2021

By Shreya

New Delhi: In a big boost to Athmanirbhar Bharat, India signed several significant defence deals with the United States of America (USA) and Russia to boost its defence sector.

To realise the dream of self-reliance in defence sector, India has inked several major defence deals with Russia, the United States of America (USA), Israel and other countries. The Narendra Modi government at the centre has always pushed for the modernisation of the Indian military. Let us take a look at the major defence deals in 2021.



India-Russia ink deal for AK-203 assault rifles India and Russia have inked a deal for the procurement of AK-203 assault rifles. This would be a big boost to self-reliance in defence. This endeavour reflects the increasing paradigm shift in defence acquisition from buy globally to Make in India.

The project will provide business opportunities to various MSMEs and other defence industries for supply of raw material and components, which will lead to generation of new employment opportunities. The project marks a significant stride towards making UP a key contributor in the ascendent defence manufacturing prowess of India.

The 7.62 X 39mm caliber AK-203 Rifles will replace in-service INSAS Rifle inducted over three decades back. AK-203 Assault Rifles, with an effective range of 300 meters, are light weight, robust and easy to use Modern Assault Rifles with proven technology that will enhance the combat potential of soldiers to adequately meet present and envisaged operational challenges. They will

enhance the operational effectiveness of the Indian Army in Counter Insurgency/Counter Terrorism operations.

India-US Predator drones deal

In a big step towards strengthening military ties with the US, the Indian Defence Ministry has approved the acquisition of 30 Predator drones for the three defence forces.

As per the deal, all three services are likely to get 10 drones each for the three services (Army, Navy and IAF)-from the US worth \$3 billion (approximately Rs 22,000 crore).

The armed drone will further sharpen India's offensive capabilities as till date Indian military only operates drones for surveillance and reconnaissance missions.

The remotely piloted drones, manufactured by US defence major General Atomics, are capable of remaining airborne for around 35 hours and can be deployed on a range of missions including surveillance, reconnaissance, intelligence gathering and destroying enemy targets.

The medium-altitude long-endurance (MALE) Predator-B drone is the first hunter-killer unmanned aerial vehicle (UAV) designed for long-endurance and high-altitude surveillance.

India, Russia sign agreements for arms production, cooperation

India inked a pact on amending the agreement on cooperation in the field of manufacturing of the Kalashnikov series of small arms that was originally sealed in February 2019. Another agreement was signed on the protocol of the 20th IRIGC-M&MTC.

Next-generation drones, robotics

In reflection of their growing defence ties, India and Israel sealed an agreement to jointly develop next-generation technologies and products such as drones, robotics, artificial intelligence and quantum computing, officials said.

The Bilateral Innovation Agreement (BIA) was firmed up between Defence Research and Development Organisation (DRDO) and Israel's Directorate of Defence Research and Development (DDR&D).

"Under the agreement, startups and industry of both countries will work together to bring out next-generation technologies and products in the areas such as drones, robotics, artificial intelligence, quantum technology, photonics, biosensing, brain-machine interface, energy storage, wearable devices, natural language processing, etc," the ministry said in a statement.

India is a major buyer of Israel's military hardware. Israel has been supplying various weapon systems, missiles and unmanned aerial vehicles to India over the last few years but the transactions have largely remained behind the curtains.

<https://www.oneindia.com/india/4-major-defence-deals-inked-by-india-in-2021-3346823.html>

COVID 19: DRDO's Contribution



Press Information Bureau
Government of India

Ministry of Health and Family Welfare

Fri, 10 Dec 2021 4:30PM

The Government has sanctioned 1563 PSA Oxygen Generation Plants

The Government has sanctioned 1563 Pressure Swing Adsorption (PSA) oxygen generation plants of which 1463 have been commissioned. These include 1225 PSA plants which have been installed and commissioned under PMCARES Fund in every district of the country. Additionally, 338 PSA Plants are set up by PSUs of Ministry of Petroleum & Natural Gas, Ministry of Power, Ministry of Coal, Ministry of Railways etc. till date. The States have also been asked to install PSA plants in public health facilities and facilitate installation of PSA plants in private health facilities. The details are as per Annexure.

The Empowered Group constituted by the Government on Emergency Management Plan and Strategy recommended that for calculation of oxygen demand, the required rates of oxygen flow in non-ICU and ICU setting are 10 and 24 liters per minute per day per case, respectively.

Based on the above, these plants can support more than 1,00,000 beds/day.

The PSA Plants under PMCARES have been supplied and commissioned by the Central Government. States provided for space, 3-phase power supply, DG set for uninterrupted power supply and availability of Medical Gas Pipeline system (MGPS) for interconnection with PSA plant.

Annexure

	PM CARES	GoI PSUs etc
State/ UT	Commissioned	Commissioned
A&N Island	3	0
Andhra Pradesh	28	4
Arunachal Pradesh	27	1
Assam	40	10
Bihar	62	12
Chandigarh	4	
Chhattisgarh	49	7
D&D D&D	4	
Delhi	25	18
Goa	7	
Gujarat	59	12

Haryana	40	5
Himachal Pradesh	28	1
J&K	32	
Jharkhand	38	7
Karnataka	50	36
Kerala	26	6
Ladakh	7	2
Lakshadweep	2	
Madhya Pradesh	88	20
Maharashtra	68	13
Manipur	16	1
Meghalaya	14	0
Mizoram	14	0
Nagaland	15	0
Odisha	39	9
Puducherry	8	
Punjab	41	4
Rajasthan	51	20
Sikkim	4	1
Tamil Nadu	70	7
Telangana	50	2
Tripura	14	
Uttar Pradesh	128	34
Uttarakhand	25	2
West Bengal	49	2
Other Agencies (DRDO, IRCS)		2
Total	1225	238

The Union Minister of State for Health and Family Welfare, Dr Bharati Pravin Pawar stated this in a written reply in the Lok Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1780145>

DRDO on Twitter

MyGovIndia @mygovindia · 11h
With high precision strike capability, the Made In India Stand-off Anti-tank (SANT) Missile gives India's #Aatmanirbhar Defence drive the cutting-edge it needs. #TransformingIndia @DRDO_India @IAF_MCC



'Make in India' Success
DRDO SUCCESSFULLY TESTS STAND-OFF ANTI-TANK (SANT) MISSILE, THAT CAN NEUTRALISE TARGETS WITHIN 10 KM RANGE

0:01 | 1.9K views

MyGovIndia @mygovindia · 13h
.@DRDO_India successfully tests the upgraded PINAKA-ER with an extended range of over 70 Kms #AatmaNirbharBharat #TransformingIndia



On-Target to Achieve AatmaNirbharta!
DRDO SUCCESSFULLY TESTS PINAKA-ER, AREA DENIAL MUNITIONS (ADM) & NEW INDIGENOUS FUZES

0:12 | 2.6K views



रक्षा मंत्री कार्यालय/ RMO India @DefenceMinIndia · 21h

जबकि भारत की मिसाइलों के नाम होते हैं आकाश, पृथ्वी, अग्नि। अब तो हमारी एक मिसाइल का नाम संत भी रखा गया है। कल ही उसका एक सफल परीक्षण हुआ है। मैं @DRDO_India की पूरी टीम को बधाई देता हूँ : रक्षा मंत्री



A. Bharat Bhushan Babu @SpokespersonMoD · Dec 11

Pinaka-ER Multi Barrel Rocket Launcher System jointly designed by laboratories of @DRDO_India - Armament Research & Development Establishment, Pune and #HighEnergyMaterialsResearchLaboratory, Pune, successfully tested at Pokharan range.

Press Release: pib.gov.in/PressReleasePa...



PRO Defence Pune @PRODefPune · 2h

Pinaka-ER Multi Barrel Rocket Launcher System jointly designed by laboratories of @DRDO_India - Armament Research & Development Establishment, Pune and #HighEnergyMaterialsResearchLaboratory, Pune, successfully tested at Pokharan range.

Press Release: pib.gov.in/PressReleasePa...



 **ANI** 
@ANI

#WATCH | Extended Range Pinaka (Pinaka-ER) Multi Barrel Rocket Launcher System successfully tested at Pokhran Range. The system is designed by DRDO Laboratory ARDE along with HEMRL, Pune, the technology has been transferred to the Indian industry.

(Source: DRDO)

  **Watch on Twitter**



 **DRDO** 
@DRDO_India

Successful tests of Pinaka Extended Range (Pinaka-ER), Area Denial Munitions (ADM) and indigenously developed fuzes were carried out at various test ranges.

pib.gov.in/PressReleaseDet...

  **Watch on Twitter**

12:09 PM · Dec 11, 2021 



 **DRDO** ✓
@DRDO_India

Indigenously designed and developed Helicopter launched Stand-off Anti-tank (SANT) Missile was successfully flight tested from Pokhran ranges.

pib.gov.in/PressReleasePa...



6:01 PM · Dec 11, 2021

 **DRDO** ✓ @DRDO_India · 19h

Igniting young minds & inspiring next gen technopreneurs, DRDO marks its presence at India Intl Science Festival #IISF2021 at Panaji, Goa. Honble Union Minister of State for S&T @DrJitendraSingh evincing keen interest in various DRDO Systems & Technologies. #AmritMahotsav



Defence Strategic: National/International



Press Information Bureau
Government of India

Ministry of Defence

Fri, 10 Dec 2021 3:50PM

Self-Reliance in Defence Sector

The total amount disbursed between 2018-2021 under the Innovations for Defence Excellence (iDEX) scheme, Company-wise and State-wise is as follows:

Support for Prototype and Research Kickstart (SPARK) Grant

(In Rupees)

Sl. No	Name of iDEX Winner	State	Total (2018 -2021)
1	Aditya Precitech Private Limited	Telangana	15,00,000
2	Alpha Design Technologies Pvt Ltd	Karnataka	28,55,000
3	Anvation Labs Pvt Ltd	Telangana	14,95,816
4	Astrome Technologies Private Limited	Karnataka	28,96,275
5	Big Bang Boom Solutions Pvt Ltd	Tamil Nadu	82,73,206
6	BigCat Wireless Pvt Ltd	Karnataka	61,50,000
7	Centre for Study of Science Technology and Policy	Karnataka	15,00,000
8	Chipspirit Technologies Pvt Ltd	Karnataka	44,23,138
9	Dimension NXG Private Limited	Maharashtra	87,00,000
10	DV2JS Innovation	Delhi	52,50,000
11	Gurutvaa Systems Pvt Ltd	Maharashtra	40,50,740
12	Gyan Data Private Limited	Tamil Nadu	5,64,109
13	HW Design Lab Pvt Ltd	Kerala	13,42,405
14	Iotina Technologies Pvt Ltd	Uttar Pradesh	9,98,180
15	Irov Technologies Private Limited	Kerala	14,36,500
16	ISenses Incorporation PVt Ltd	Rajasthan	15,00,000
17	Kinetix Engineering Solutions Limited	Karnataka	45,00,000
18	Lekha Wireless Solutions Pvt Ltd	Karnataka	56,50,746
19	Logic Fruit Technologies Pvt Ltd	Haryana	13,36,783
20	MMRFIC Technology Private Limited	Karnataka	45,19,290

21	Navyug Infosolutions Private Limited	Uttar Pradesh	44,99,924
22	Nopo Nanotech Pvt Ltd	Karnataka	10,41,350
23	North Street Cooling Towers Pvt Ltd	Uttar Pradesh	90,00,000
24	Nyokas Technologies Private Limited	Kerala	11,45,200
25	Optimized Electrotech Pvt Ltd	Karnataka	7,49,750
26	OSSUS Biorenewables Pvt Ltd	Karnataka	12,08,662
27	Radome Technologies and Services Pvt Ltd	Karnataka	22,60,247
28	Saif Automations Services LLP	Andhra Pradesh	22,85,104
29	SCI-COM Software India Pvt Ltd	Maharashtra	44,99,600
30	Tatvabodh Technology Pvt. Ltd	Haryana	13,82,500
31	Tonbo Imaging India Private Limited	Karnataka	45,00,000
32	Zmotion Autonomous Pvt Ltd	Karnataka	15,00,000
Grand Total			10,30,14,525

Funds Disbursed to Partner Incubators (PIs) under CSR by DPSUs:

(in Rupees)

Sl. No	Partner Incubators	State	Total (2018-2021)
1	SINE, IIT Bombay	Maharashtra	50,00,000
2	Maker Village, Kochi	Kerala	20,00,000
3	IIT MIC, IIT Madras	Tamil Nadu	60,00,000
4	Forge, Coimbatore	Tamil Nadu	1,10,00,000
5	iTIC, IIT Hyderabad	Telangana	12,00,000
6	CIIE, IIM Ahmedabad	Gujarat	55,00,000
7	FITT, IIT Delhi	Delhi	60,00,000
8	T-Hub Hyderabad	Telangana	80,00,000
Grand Total			4,47,00,000

Till date, iDEX has launched five rounds of Defence India Startup Challenges (DISCs), and three rounds of Open Challenge (OC), receiving more than 2000 applications from innovators. iDEX has been able to fund projects in many technological areas under DISCs and OC through the

Support for Prototype and Research Kickstart (SPARK) framework, which entail provisioning of grants upto Rs 1.50 crore to the startups.

The Partner Incubators (PIs) bridge the gap between the requirements of startups and technological expertise required to develop the product. iDEX also features as a procurement avenue under the Defence Acquisition Procedure-2020. The Government has approved a scheme worth Rs 498.78 Crore to scale up iDEX in the next five years. 60 contracts for developing innovative prototypes have been signed under iDEX.

The establishment of iDEX is aimed at creation of an ecosystem to foster innovation and technology development in Defence and Aerospace by engaging Industries including MSMEs, start-ups, individual innovators, R&D institutes and academia and provide them grants/funding and other support to carry out R&D development which has good potential for future adoption for Indian defence and aerospace needs. Accordingly, as per the feature incorporated in the Defence Acquisition Procedure, the prototypes that have been successfully developed through the iDEX framework find the route for procurement by the concerned Services. In line with the above, the Indian Navy has already placed a Supply Order on one iDEX Winner. The Defence Public Sector Undertakings (DPSUs) are also mandated to follow similar procurement procedure for iDEX cases.

Under the iDEX scheme, Memorandum of Understanding (MoUs) have been signed with 11 incubators. Out of the 11 Partner Incubators, 7 are Institutes of National Importance and 1 is Institute of Eminence.

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Col Rajyavardhan Rathore (Retd) in Lok Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1780099>

THE TIMES OF INDIA

Sat, 11 Dec 2021

HAL heritage exhibition from Monday

Bengaluru: Defence PSU Hindustan Aeronautics Ltd (HAL) will organise week-long exhibitions at six locations across the country to commemorate the 75th year of independence. They will showcase HAL's 80-year heritage and current/futuristic products.

"The defence minister will virtually inaugurate these activities on December 13. Exhibitions will be held at HAL Heritage Centre and Aerospace Museum, Bengaluru, and at its divisions in Nashik, Kanpur, Hyderabad, Koraput and Lucknow," the PSU said in a statement.

Dedicated hangars will showcase HAL-produced aircraft, helicopters, aero-engines, avionics, components and LRUs (line replacement units). The exhibition will be open till December 19 between 9am and 5pm. There is no entry fee for members of the public.

Major attractions

"The CATS Warrior UAV mock-up model will be the star attraction at HAL museum, Bengaluru. The model of LCA Tejas and its LRUs, mission computer of Jaguar DARIN III and Mirage 2000 I, Shakti engine, castings, forgings, communications systems and an operational model of ALH (helicopter) transmission system will be on display. Photographs charting the Indian aerospace industry's growth will also be on display," the PSU added.



Display platform: The CATS Warrior UAV mockup model is expected to be the star attraction at HAL Heritage Centre and Aerospace Museum in Bengaluru

“HAL is also facilitating the visit of school and college students to the exhibition to witness the progress of the industry and learn about indigenous technology. Entry will be with valid ID cards. Students will be allowed with their school/college IDs. Covid protocols will be applicable,” the PSU said.

<https://timesofindia.indiatimes.com/city/bengaluru/hal-heritage-exhibition-from-monday/articleshow/88216015.cms>



Sat, 11 Dec 2021

Igla-S Missile: After S-400 deal, India likely to acquire another powerful air defense system from Russia

By Kashish Tandon

After S-400 and AK-203 deals, the next big agreement between India and Russia could be on Igla-S man-portable missile defense system, a top Russian official told a leading Indian daily.

Russian President Vladimir Putin and India Prime Minister Narendra Modi held summit-level talks in New Delhi on December 6 in the backdrop of the two countries signing as many as 28 agreements/MoUs to expand partnership in defense and space among other areas.

Putin's India visit was significant given this was only the second official trip undertaken by the Russian President to a foreign country since the COVID-19 pandemic. For New Delhi, the summit was important not just for strengthening ties with Moscow but also to keep the supply of weapons from Russia running amid the “worst border standoff” with China.

Prior to the meeting between Indian PM and the Russian President, India and Russia signed agreements to procure 601,427 AK-203 assault rifles of the dimensions 7.63×39 nm, through the Indo-Russia Rifles Pvt. Ltd., under the military-technical cooperation agreement for 2021-31, Business Standard reported.

It is pertinent to mention that India has started receiving the Russian-made S-400 Triumf air defense systems, as part of a \$5.4 billion deal signed in 2018, The EurAsian Times reported last month.

Igla-S Missile

The next big deal between Moscow and New Delhi could be the Igla-S man-portable air missile, Russian Federal Service for Military-Technical Cooperation (FSMTC) chief Dmitry Shugaev told The Economic Times.

India had issued a request for proposal (RFP) in October 2010 to procure over 5,000 missiles, 258 single-launchers and 258 multi-launchers, worth around Rs 6,400 crore.

Trials for the same began in 2012. Russia's Igla-S bid was declared as L1 (lowest bidder) or the winner in this competition. The contenders for this contract were Rosoboronexport from Russia, MBDA from France, and SAAB from Sweden, The Times of India reported.

Following the victory of the Igla-S, SAAB and MBDA officially registered complaints stating that the trials were set in a way that they gave the Russians an edge above them. Despite this controversy, the Igla-S deal has been on track. According to officials involved in the deal, the contract could be signed by January, The Hindu reported.



9K338 Igla-S man-portable air defense system – KMB

“One of the important contracts that we expect to sign soon is for the supply and licensed production of Igla-S man-portable air defense missile systems in India. This means that we transfer the production license and supply the necessary components to the Indian side,” Shugaev told The Economic Times in an interview.

The Igla-S man-portable air defense missile system (MANPADS) is designed in a way for countering low-flying aircraft, as it forms the last line of defense against flying objects in a multi-layered air defense system.

The Igla-S is capable of engaging all types of visually observable aircraft and helicopters as well as identifying air targets such as cruise missiles and UAVs, both head-on and receding, at any time of day, against background clutter and decoy flares (jamming).

It is an advanced version of the Igla MANPADS with increased combat efficiency, especially for firing cruising missiles and identifying targets.

The Igla-S system comprises combat equipment, including the 9M342 missile and the 9P522 launching mechanism; maintenance equipment, including the 9V866-2 mobile test station and the 9F719-2 test set; training facilities; night firing devices, The EurAsian Times had reported.

According to the developer, Igla-S missiles assure 24*7 close air protection of military installation & civilian assets from attacks by tactical aircraft (fighters, assault aircraft, fighter-bombers). It can also neutralize combat helicopters as well as cruise missiles and unmanned aerial vehicles (UAVs) in head-on and tail-chase engagements against clutter background and in countermeasure environments when they are visually observed.

<https://eurasianimes.com/igla-s-missile-india-likely-to-acquire-air-defense-system-from-russia/>



Mon, 13 Dec 2021

S-400 is symbol of Indian sovereignty, hope to complete naval, logistics agreements next year: Russian diplomat

Apart from bilateral ties, Mr. Babushkin said that India-Russia cooperation on multilateral issues had grown

By Suhasini Haider, Dinakar Peri

The S-400 missile system deal is a symbol of the strength of India’s “sovereignty” said a Russian official, denying that the deal or other major agreements due to be signed during the visit of Russian President Vladimir Putin last Monday had been put on the backburner due to concerns over U.S. sanctions.

During the one-day summit, which included a meeting between Mr. Putin and PM Narendra Modi and ministerial meetings, the two sides announced 28 agreements and issued a 99-point joint statement. However, key agreements that had been outlooked for signing during the meetings, including the Reciprocal Exchange of Logistics Agreement (RELOS) and a Navy to Navy cooperation MoU by diplomats ahead of Mr. Putin’s visit, which led to speculation that New Delhi had chosen to hold off on these as well as other expected deals for fighter jets and short range missiles until there is more clarity on whether the U.S. will impose sanctions over the delivery of the S-400 Triumpf missile systems.



File photo of Russian S-400 defence missile systems. | Photo Credit: AP

“The Summit came at very short notice, and that is one of the main reasons some particular agreements were not completed” said Roman Babushkin Deputy Russian Ambassador to India, denying there was any delay in negotiations. “All these deals including the naval cooperation MoU, RELOS will be completed at the earliest convenience when the two sides will be meeting for some occasions during the course of the next year,” he added, during an interview to *The Hindu*.

Apart from bilateral ties, Mr. Babushkin said that India-Russia cooperation on multilateral issues had grown, especially with India supporting Russia’s bid to become an observer state at the Non-Aligned Meet (NAM) this year, and Russian support to India at the SCO. Moscow is now speaking to the Modi government about holding a “to donor conference” amongst other initiatives that are part of a new roadmap for interaction on Afghanistan finalised during the Putin visit, and has also pitched for India and Iran to be included in the “Troika plus” mechanism of Russia-US-China and Pakistan which New Delhi has long felt cut out of.

As *The Hindu* had reported, the Modi government has not yet decided on whether to send any Indian officials to Kabul, but was considering its options given that about 10 countries including Russia have missions open there.

“Our presence in Kabul is very important for safety of Russians there...We know that more countries are quite keen to come back including the European Union, Germany, Indonesia, and other, according to media reports. So in case the Indian side would be interested in a serious discussion about the Indian presence in Afghanistan, the Russian side would be very open for any dialogue on supporting India,” Mr. Babushkin said in the interview, where he described the outcomes of the 21st India-Russia summit held last week.

On India-Russia nuclear cooperation, he said that the Kudankulam nuclear power project involving six reactors is either operational, under construction, or about to be started, and the government is awaiting New Delhi’s response on the second site for a project for six VVER-1200 reactors.

The US administration has not yet made it clear how it hopes to proceed on the Indian S-400 deal, and whether US President Biden will use his power to waive the sanctions for India in particular, as many American Congressman have advocated. However, the US State department spokesperson has said that there will be no “blanket” waiver for India, indicating that even if the S-400 deal is not sanctioned, other “significant” military and nuclear transactions could still trigger sanctions under CAATSA.

“The S-400 decision is a very strong example of how advanced our defence and strategic partnership is, and how strong Indian sovereignty is, to choose its international partners, especially when it comes to issues of national interest and national security,” the Russian diplomat said, calling the US CAATSA sanctions law an “illegal tool for unlawful competition” and added that the S-400 project does not target the US in any way. Confirming that the delivery of the first of five S-400 systems from Russia is expected to be completed this month, he said that India and Russia were discussing how to use the alternate Rupee-Rouble system for payments that would not be impinged by any sanctions. In 2018 the US sanctioned China, and in 2020 sanctioned Turkey for buying the S-400, and placed defence entities and officials under financial and visa bans.

<https://www.thehindu.com/news/national/s-400-is-symbol-of-indian-sovereignty-hope-to-complete-naval-logistics-agreements-next-year-russian-diplomat/article37939849.ece>

China developing 6,000 mph hypersonic nuke missile ‘based on design’ ditched by NASA

By Patrick Knox

China is developing a 6,000 mph hypersonic nuke missile engine which is reportedly based on a design abandoned by Nasa — as it forges ahead in an arms race with the West.

A Chinese research team has built and tested a prototype based on a radical design by an American space agency scientist more than two decades ago.

Most hypersonic aircraft have an engine at the belly.

But the experimental Two-Stage Vehicle (TSV) X-plane was driven by two separate engines on the sides.

It was proposed by Ming Han Tang, a Chinese American who was the chief engineer of Nasa’s hypersonic programme in the late 1990s, reports South China Morning Post.



The Boeing Manta X-47C which was part of the abandoned NASA project now taken up by the Chinese. Handout

The engines could switch to a high-speed mode and accelerate to more than five times the speed of sound. Yet the Boeing Manta X-47C, a programme to test Tang’s design was ditched by the US government in the early 2000s because it was deemed too costly.

In today’s rapidly militarising China, however, money is no object — especially if it keeps the communist regime ahead in the arms race.

And, so professor Tan Huijun and his colleagues, at the Nanjing University of Aeronautics and Astronautics in the eastern province of Jiangsu have built a prototype machine based on Tang’s blueprint. The design has attracted increasing attention because “understanding its work mechanism can provide important guidance to hypersonic plane and engine development”, Tan and colleagues said in a paper published in the Chinese peer-reviewed Journal of Propulsion Technology. It comes as China fired a hypersonic missile around the globe in October with the US left reeling by the terrifying display of military strength.

US intelligence and military officials were reportedly left stunned after China launched a rocket in space carrying a hypersonic glide vehicle that circled the globe before speeding towards its target. The nuke-capable missile missed its target by about two-dozen miles when it was secretly launched in August, intelligence sources told the Financial Times.

But the chilling test has alarmed US officials and shows how China has made astonishing progress on the development of its hypersonic weapons, sources said.

A hypersonic missile travels five times faster than the speed of sound and can reach distances of up to 1,500 miles, with Russia using the technology to build cutting-edge missiles in recent years.

China has been scrambling to build powerful weapons in a terrifying arms race.

An Asian national security official and a Chinese security expert close to the People’s Liberation Army said the weapon in China was being developed by the country’s Academy of Aerospace Aerodynamics. A number of rocket launches have been publicly announced by the China Academy of Launch Vehicle Technology – but the hypersonic missile test in August was reportedly kept secret. US intelligence and military officials were reportedly left stunned after China launched a rocket in space carrying a hypersonic glide vehicle that circled the globe before speeding towards its target.

<https://nypost.com/2021/12/10/china-developing-6000-mph-hypersonic-uke-missile-based-on-design-ditched-by-nasa/>

A quantum approach to a singularity problem

One of the major issues in general relativity that separates it from other descriptions of the universe, like quantum physics, is the existence of singularities. Singularities are points that when mathematically described give an infinite value and suggest areas of the universe where the laws of physics would cease to exist—i.e. points at the beginning of the universe and at the center of black holes.

A new paper in *Nuclear Physics B*, published by Roberto Casadio, Alexander Kamenshchik, and Iberê Kuntz from the Dipartimento di Fisica e Astronomia, Università di Bologna, Italy, suggests that extending the treatment of singularities in classical physics into quantum physics could help to solve this disparity between branches of physics.

"No description of nature is perfect and complete. Every theory has its domain of applicability, beyond which it breaks down and its predictions no longer make sense," Casadio says. As an example, he cites Newton's theories, which are still robust enough to send rockets to space, but fall down when describing the very small, or the tremendously massive.

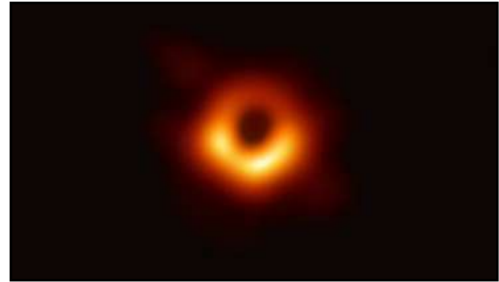
"This is a serious issue because general relativity—the theory that best describes the gravitational interaction at present—predicts the existence of singularities quite generically," Casadio says. "It is like having a hole in space, where nothing can exist, but into which observers and everything else will fall nonetheless."

Casadio suggests that this can be envisaged as a piece of paper with a small hole in it. "You can move the tip of your pen on the paper, which represents the movement of a particle, but if you reach the hole your pen suddenly stops drawing and the particles suddenly disappear," he says. "This illustrates how singularities are theoretical obstacles preventing us from fully understanding nature."

Casadio adds that the fact that physics ceases to exist at singularities leads to unanswered questions such as: What really happened at the beginning of the universe? Was everything born out of a point that never really existed? What happens to a particle when it falls into the center of a black hole?

"These open questions are the very reason we are compelled by our curiosity to pursue this line of investigation," he says. "Our approach heavily relies on the methods of Quantum field theory (QFT): the framework that combines quantum mechanics and special relativity and gives rise to the very successful standard model of particle physics."

The authors used the tools of QFT to construct a mathematical object that can signal the presence of singularities in experimentally measurable quantities. This object, which they have named the "functional winding number" is non-zero in the presence of singularities and vanishes in their absence.



A new quantum approach to the problem of singularities could answer the question of what happens at the center of a black hole like this one found in the galaxy M87. Credit: Event Horizon Telescope collaboration et al.

This approach has revealed that certain singularities predicted theoretically do not affect quantities that can in principle be measured experimentally, and therefore remain harmless mathematical constructs.

"If our formalism survived scientific scrutiny and turned out to be the correct approach, it would suggest the existence of a very deep physical principle, so the choices of physical variables are rather unimportant," Casadio concludes. "This could be consequential for our understanding of physics, even beyond the subject of singularities."

More information: Roberto Casadio et al, Covariant singularities in quantum field theory and quantum gravity, *Nuclear Physics B* (2021). DOI: [10.1016/j.nuclphysb.2021.115496](https://doi.org/10.1016/j.nuclphysb.2021.115496)
<https://phys.org/news/2021-12-quantum-approach-singularity-problem.html>



Sat, 11 Dec 2021

Atom laser creates reflective patterns similar to light

Cooled to almost absolute zero, atoms not only move in waves like light but also can be focused into shapes called caustics, similar to the reflecting or refracting patterns light makes on the bottom of a swimming pool or through a curved wine glass.

In experiments at Washington State University, scientists have developed a technique to see these matter wave caustics by placing attractive or repulsive obstacles in the path of a cold atom laser. The results are curving cusps or folds, upward or downward "V" shapes, which the researchers describe in a paper for *Nature Communications*.

While it is foundational research, these caustics have potential applications for highly precise measurement or timing devices such as interferometers and atomic clocks.

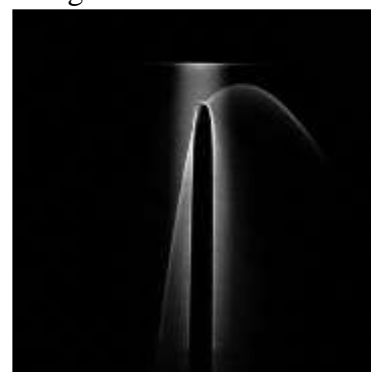
"It's a beautiful demonstration of how we can manipulate matter waves in a way that is very similar to how one would manipulate light," said Peter Engels, WSU Yount distinguished professor and the paper's senior author. "An atom is accelerated by gravity, so therefore, we can mimic effects that would be very difficult to see with light. Also, since atoms respond to many different things, we can potentially exploit this for new types of sensors that are particularly good at detecting magnetic fields, gradients in electric fields or in gravity."

To achieve these effects, first the scientists had to create one of the coldest places on Earth, which they were able to accomplish in the Fundamental Quantum Physics lab at WSU. Engels and his colleagues used optical lasers to take energy out of an atomic cloud trapped inside a vacuum chamber, cooling it very close to absolute zero (-273.15 degrees Celsius or -459.67 degrees Fahrenheit).

This extreme cold makes atoms behave quantum mechanically in ways very different from the familiar laws of nature. In these conditions, instead of behaving like particles of matter, the atoms move like waves. Clouds formed of such atoms are known as Bose-Einstein condensates, named after the theorists whose work first predicted this state of matter, Albert Einstein and Satyendra Nath Bose.

In the process of exploring these condensates, the researchers at WSU created a cold atom laser, meaning the wave-like atoms started lining up in a column and moving together.

"A light laser is a collimated, coherent stream of photons, and we're essentially doing that with atoms," said Maren Mossman, the paper's first author who worked on the project as a WSU post-



An atom laser flowing from top to bottom makes a "caustic", a refracted pattern like that often made by light, as it encounters an obstacle. Credit: Washington State University

doctoral fellow and is now the Clare Boothe Luce assistant professor of physics at the University of San Diego. "The atoms sort of walk together and behave as one object. So then, we decided to see what happens if we poked this."

For this study, the researchers 'poked' at the atom laser by putting optical obstacles in its path, essentially shining specific wavelengths of laser lights onto the accelerating stream of atoms. One obstacle type repelled the atoms and made caustics in downward fold shapes; another attracted them making caustics in upward cusp shapes.

The system is also very tunable, the researchers said, meaning they can change how fast the atoms accelerate.

"Caustics in atom lasers have never really been studied with this flexibility," said Engels.

In addition to Engels and Mossman, the co-authors include Michael Forbes, WSU associate professor in the Department of Physics and Astronomy and Thomas Bersano, a former WSU post-doctoral fellow now at Los Alamos National Laboratory.

More information: Gravitational caustics in an atom laser, *Nature Communications* (2021). [DOI: 10.1038/s41467-021-27555-3](https://doi.org/10.1038/s41467-021-27555-3)

Journal information: [Nature Communications](https://phys.org/news/2021-12-atom-laser-patterns-similar.html)
<https://phys.org/news/2021-12-atom-laser-patterns-similar.html>



Sat, 11 Dec 2021

Exotic six-quark particle predicted by supercomputers

The predicted existence of an exotic particle made up of six elementary particles known as quarks by RIKEN researchers could deepen our understanding of how quarks combine to form the nuclei of atoms.

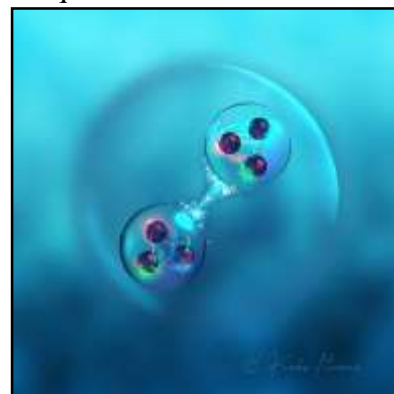
Quarks are the fundamental building blocks of matter. The nuclei of atoms consist of protons and neutrons, which are in turn made up of three quarks each. Particles consisting of three quarks are collectively known as baryons.

Scientists have long pondered the existence of systems containing two baryons, which are known as dibaryons. Only one dibaryon exists in nature—deuteron, a hydrogen nucleus made up of a proton and a neutron that are very lightly bound to each other. Glimpses of other dibaryons have been caught in nuclear-physics experiments, but they had very fleeting existences.

"Although the deuteron is the only known stable dibaryon, many more dibaryons may exist," says Takuya Sugiura of the RIKEN Interdisciplinary Theoretical and Mathematical Sciences Program. "It's important to study which pairs of baryons form dibaryons and which do not because this provides valuable insights into how quarks form matter."

Quantum chromodynamics is a highly successful theory that describes how quarks interact with each other. But the strong coupling that occurs between quarks in baryons complicates quantum chromodynamics calculations. The computations become even more complex when considering bound states of baryons such as dibaryons.

Now, by calculating the force acting between two baryons each containing three charm quarks (one of the six types of quarks), Sugiura and his co-workers have predicted the existence of a dibaryon they called the charm di-Omega.



An artist's impression of a newly predicted six-quark state (dibaryon) consisting of two baryons. Credit: 2021 Keiko Murano

For this calculation, the team solved quantum chromodynamics with large-scale numerical calculations. Since the calculations involved a vast number of variables, they used two powerful supercomputers: the K computer and the HOKUSAI supercomputer. "We were extremely fortunate to have had access to the supercomputers, which dramatically reduced the cost and time to perform the calculations," says Sugiura. "But it still took us several years to predict the existence of the charm di-Omega."

Despite the complexity of the calculations, the charm di-Omega is the simplest system for studying interactions between baryons. Sugiura and his team are now studying other charmed hadrons using the supercomputer Fugaku, which is the K computer's more powerful successor. "We're especially interested in interactions between other particles containing charmed quarks," says Sugiura. "We hope to shed light on the mystery of how quarks combine to form particles and what kind of particles can exist."

The research was published in *Physical Review Letters*.

More information: Yan Lyu et al, Dibaryon with Highest Charm Number near Unitarity from Lattice QCD, *Physical Review Letters* (2021). DOI: [10.1103/PhysRevLett.127.072003](https://doi.org/10.1103/PhysRevLett.127.072003)

Journal information: [*Physical Review Letters*](#)

<https://phys.org/news/2021-12-exotic-six-quark-particle-supercomputers.html>

COVID-19 Research News



Sun, 12 Dec 2021

Nasal vaccine might help fight new COVID-19 variants: Study

The research has been published in the 'Science Immunology Journal'

Connecticut: In a new study by Yale's Akiko Iwasaki, the Waldemar Von Zedtwitz Professor of Immunobiology, it was found that intranasal vaccination provided broad-based protection against heterologous respiratory viruses in mice.

The research has been published in the 'Science Immunology Journal'.

"The best immune defence happens at the gate, guarding against viruses trying to enter," said Iwasaki, senior author of the study.

Mucous membranes contain their own immune defence system that combat air- or foodborne pathogens. When challenged, these barrier tissues produce B cells which in turn secrete immunoglobulin A (IgA) antibodies. Unlike vaccines which elicit a system-wide immune response, IgA antibodies work locally on mucosal surfaces found in the nose, stomach, and lungs.

While the protective role of IgA-producing cells had been well established in combating intestinal pathogens, Iwasaki's lab wondered if triggering IgA response might also produce a localized immune response against respiratory viruses.

Working with researchers at Icahn School of Medicine at Mount Sinai in New York, they tested a protein-based vaccine designed to jump-start an IgA immune response, administering it to mice through injections, as is commonly done with systemic immunizations, and also intranasally. They then exposed mice to multiple strains of influenza viruses. They found that mice that had received vaccine intranasally were much better protected against respiratory influenza than those that received injections. Nasal vaccines, but not the shot, also induced antibodies that protected the

animals against a variety of flu strains, not just against the strain the vaccine was meant to protect against.

The Yale team is currently testing nasal vaccine strains against COVID strains in animal models.

"While both vaccine injections and nasal vaccines increased levels of antibodies in the blood of mice, only the nasal vaccine enabled IgA secretion into the lungs, where respiratory viruses need to lodge to infect the host," Iwasaki said.

If the nasal vaccines prove to be safe and efficient in humans, Iwasaki envisions them being used in conjunction with current vaccines and boosters that work system-wide in order to add immune system reinforcements at the source of infection.

Other co-first-authors of the study are Ji Eun Oh, Eric Song, and Miyu Moriyama, all from Yale.

<https://www.deccanchronicle.com/lifestyle/health-and-wellbeing/111221/nasal-vaccine-might-help-fight-new-covid-19-variants-study.html>

